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Gas Rate Making.

By MR. HENRY I. LEA.

We are all familiar with the severe competition to which gas companies are exposed in the development of gas sales, and it is obvious that this competition from certain directions gets more keen as time goes on. Although the growth in gas sales has been very large and consistent in the face of this competition, the fact remains that the gas industry has only begun to realize its own possibilities. This, I believe, to be due to the fact that the subject of gas rate making has not been given the general and intelligent study it merits. The present common practice of selling gas at so much per thousand cubic feet, regardless of quantity consumed or conditions of service, is practically indefensible, and such companies as are still selling gas in this manner can easily be shown to be standing in the way of their own greatest development. The straight line gas rate not only prevents the realization of the greatest sales and the greatest net earnings possible, but also prevents the sale of gas at the lowest average price possible in any given community. Here, as in a good many other matters, the interest of the gas company coincides with the interest of the community, for the maximum possible net earnings of the gas company will be realized only when the maximum possible sales have been reached; and the maximum sales can be reached only through the lowest average selling price of gas capable of meeting operating expenses, depreciation, and a fair rate of return on the value of the property employed.

At first glance it would seem that reductions in the price of gas on a straight line basis from, say, $1.50 per thousand to $1.40 per thousand; then to $1.30 per thousand, and so on, would ultimately result in the maximum sales possible. This is very generally believed, but can be shown to be a fallacy. A surprisingly large percentage of all the consumers in any city are carried by the company at an actual loss. Any horizontal reduction in rates, therefore, increases the actual loss incurred by this class of consumers, and to that extent increases the burden which must be borne by the larger consumers of gas. It is obvious that if this additional burden did not have to be cared for in sales to larger consumers, a correspondingly lower average charge to these larger consumers could be made without any decrease in net earnings on gas sold them. This additional burden, therefore, will prevent, to some extent, the opening of new fields for the use of gas which might otherwise be taken on to the advantage of all concerned. With proper rates established these additional and very important fields for the use of gas will be opened, and the net earnings resulting from such additional sales will enable reduction in price to even the smallest consumer in course of time. But, it is obvious that the small consumer will never get gas at the lowest possible price except through the assistance of the larger consumers; and since the larger consumers cannot be interested at the prices necessary with straight line schedules in the interest of all concerned, gas rates should be so made that the average cost per thousand to the large consumer will be less than the average cost per thousand to the small consumer. This also follows from the fact that the selling price of gas should be based on the cost of service. There should, of course, be no discrimination in any schedules of rates adopted, but the straight line rate is nothing but a discriminatory rate against the very consumers who are of greatest assistance to the company and the small consumer. For example, the average consumer using, say 2,500 cubic feet of gas per month at $1.25 per thousand, pays to the company a certain number of cents per thousand above the actual cost of serving him. On the other hand, the consumer using 25,000 cubic feet per month, under the same general conditions, is paying to the company an average return (per thousand cubic feet above the cost of service) very greatly in excess of that paid by the smaller consumer, because the cost of serving the large consumer is not proportionate to his consumption of gas. This is due to the fact that of all the expenses incurred in the manufacture, distribution and sale of gas, a surprisingly large percentage are relatively fixed and independent of the volume of gas sold. You will recognize that there are many expenses in connection with the large consumer which are no greater than the corresponding expense in connection with the small consumer, and no rate schedule is fair to all concerned, nor to the greatest benefit of all, unless it be based primarly on cost of service.

Unfortunately, the methods of accounting in use to-day in the gas industry do not show the net earnings or the losses incurred through individual consumers or groups of consumers, and these things must be known before a correct schedule of rates can be determined. The elements involved in gas rate making are as follows: Valuation of the property and business of the company used or useful in the manufacture, distribution and sale of gas; determination of replacement annuity required by physical equipment; correct analysis of

operating expenses and of income; correct analysis of present gas sales. There has been great change in the valuing of gas properties in the past few years, due in large measure to the coming of the Public Service Commissions. Not many years ago the usual valuation of gas property was based largely on actual or prospective net earnings. The rulings of courts and commissions in later years, however, have made it necessary for those engaged in valuation work to equip themselves with a wide variety of data not previously considered essential. In present practice an exact and comprehensive inventory of all details of physical equipment is an important feature of valuation work. The reproduction cost, accrued depreciation, present value, and replacement annuity must be determined for each of the items of physical equipment. These are commonly divided into the four main groups of "real estate," "buildings," "works equipment" and "distribution system," the latter group including the important element of paving over mains and services. Furthermore, in the items constituting physical equipment, proper provision must be made for engineering and supervision, casualty liability, taxes and loss of interest during construction, and omissions and contingencies, and in addition to the physical equipment, the items of organization and legal expense, working capital and going value must be determined.

In the analysis of operating expenses it is not sufficient to know the costs that have been incurred during each of the past several years, as shown by current methods of accounting. For the reason that the costs ordinarily shown chargeable to manufacture, distribution, collection department, new business department, and executive department (or headings equivalent thereto), while correct in themselves, do not show the apportionment of expenses as required in rate making. For example, it is not enough to know that so many cents per 1,000 cubic feet sold are charged to "distribution." In rate making it is important to know that of the total charged against "distribution," a certain portion was incurred because of consumers, another portion because of meters, and another portion because of output. It is not necessary that these particular subdivisions be followed, but it is necessary that an accurate determination be made between those expenses which are relatively fixed, and those which are relatively proportionate to output. A corresponding segregation must be made for each departmental expenses as carried at present, and if replacement annuities have not been previously cared for on a correct basis, adjustments must be made on this account.

An analysis of the sources of income must also be made in order that the income due to sales of gas alone may be determined. It is frequently necessary to make still further adjustments of operating charges and of income when the rates in a city are being established for a company which also supplies other cities from the same or connected plants. A detailed analysis of present gas sales must be made in order that the relative importance of consumers in each of the various groups may be known; and such an analysis will almost inevitably show figures supprising to the local management, because relatively few companies have made a careful study of profitable or unprofitable consumers. As indicating the importance of this matter, the following table is presented, with the consent of the company for whom it was prepared. This company supplies approximately 150,000 people. Its methods for many years have been aggressively and very intelligently directed, yet the table shows that of the consumers in this city, 5,167, or almost 18 per cent., consume an average of less than 500 cubic feet of gas a month. This group of 18 per cent. of the total consumers shows an aggregate consumption of only 2.14 per cent. of the total gas sold. The table also shows that over two-thirds of all the consumers in this city use an average of less than 2,000 cubic feet per month, and consume an aggregate of only slightly over 30 per cent of the gas sold, and that 83.7 per cent. of all the consumers average less than 3,000 cubic feet per month, and consume an aggregate of 49.43 per cent. of the gas sold. In other words, 16.3 per cent. of the consumers buy more than half of the gas sold.

There is probably no other city in America in which the relative importance of the different groups would be just as shown here, and it is, therefore, imperative that such a determination be made for each company, if rates are to be correctly made. I dare say that the great majority of the gas companies in the United States will show a relatively larger number of small consumers than is the case with this particular company. In some companies that have come under the observation of the writer, more than 50 per cent. of the consumers burn an average of less than 1,000 cubic feet of gas per month.

If each consumer were to pay the actual cost of serving him (including replacement annuity) and a fair return on the value of the property and business required by him, there would be a surprising readjustment of charges. For instance, a consumer using only 250 cubic feet per month would, on this basis, depending on his location, pay for that small quantity at a rate ordinarily between $6 and $12 per 1,000 cubic feet; whereas the consumer using 50,000 cu. ft. per month, would pay an average price per 1,000 very considerable below the usual price at which gas is sold in such quantities to-day. It is obviously impossible to obtain from the small consumer his fair proportion of total charge necessary, and the difference between what is actually received and what should be received from the small consumer, must be borne by the larger consumers. As a specific in-

Analysis of Gas Sales to General Consumers.

Average Monthly Consumption Throughout Year. (Cubic Feet)	Number of Consumers in Each Group	Percentage of Total Number of Consumers Represented by Groups		Average Monthly Consumption of each Group. (Cubic Feet.)	Percentage of Total Consumption Represented by Groups.	
0 to 500	5,167	17.99	....	1,300,000	2.14	....
500 to 1,000	5,074	17.66	35.65	3,800,000	6.26	8.40
1,000 to 1,500	4,929	17.16	....	6,100,000	10.05	....
1,500 to 2,000	4,055	14.12	66.93	7,100,000	11.70	30.15
2,000 to 2,500	2,917	10.16	....	6,500,000	10.71	...
2,500 to 3,000	1,898	6.61	83.70	5,200,000	8.57	49.43
3,000 to 3,500	1,174	4.09	....	3,800,000	6.26	....
3,500 to 4,000	820	2.85	90.64	3,000,000	4.94	60.63
4,000 to 4,500	559	1.95	....	2,400,000	3.95	....
4,500 to 5,000	383	1.33	93.92	1,800,000	2.97	67.55
5,000 to 5,500	286	1.00	....	1,500,000	2.47	....
5,500 to 6,000	208	0.72	95.64	1,200,000	1.98	72.00
6,000 to 6,500	187	0.65	....	1,100,000	1.81	....
6,500 to 7,000	112	0.39	96.68	700,000	1.15	74.96
7,000 to 7,500	105	0.37	....	700,000	1.15	....
7,500 to 8,000	88	0.31	97.36	700,000	1.16	77.27
8,000 to 9,000	162	0.56	97.92	1,300,000	2.14	79.41
9,000 to 10,000	114	0.40	98.32	1,100,000	1.81	81.22
10,000 to 12,500	156	0.54	98.86	1,700,000	2.80	84.02
12,500 to 15,000	93	0.32	98.18	1,300,000	2.14	86.16
15,000 to 17,500	56	0.19	99.37	900,000	1.40	87.64
17,500 to 20,000	25	0.09	99.46	400,000	0.66	88.30
20,000 to 25,000	44	0.15	99.61	900,000	1.48	89.78
25,000 to 50,000	72	0.25	99.86	2,700,000	4.45	94.23
50,000 to 100,000	34	0.12	99.98	2,500,000	4.12	98.35
100,000 to 300,000	7	0.02	100.00	1,000,000	1.65	100.00
	28,725	100.00		60,700,000	100.00	

stance, it can be shown that in the city from whose records the above table was compiled, that approximately 70 per cent. of all the consumers are paying less than they should pay. This does not, however, preclude the possibility of overcoming this difficulty in large degree. It can probably never be overcome entirely, because the established selling prices of gas have already gone so low that in most cases they represent a lower initial rate than will ever be sufficent to cover the cost of serving the smallest consumers. The most obvious step in correcting the present inadequacy of rates is to prevent further reductions in the price of gas on a straight line basis, as there is certainly no justification for a reduction in price to those consumers who are already paying less than they should. The logical method for readjustment of rates is to hold the existing primary rate for such monthly consumption as yield a revenue insufficient to cover operating expenses, replacement annuity and a fair rate of return on the value of the property and business employed; and to make reductions only on such monthly consumptions as yield a revenue in excess of this requirement. From this it is obvious that the straight line method of selling gas is indefensible, for it is distinctly against the best interests of the municipality served, as well as against the company rendering the service.

On the other hand, a properly designed step rate schedule is in the interest of all concerned, and by this means the greatest sales of gas can be developed, the greatest net earnings realized, and the lowest possible average selling price for gas reached and maintained. The step rate schedule, properly determined, is in no sense discriminatory, since exactly the same average charge per 1,000 is made to all consumers making like demands. The adoption of reduced rates for larger quantities opens fields for the use of gas which could not otherwise be reached, and brings about additional net earnings, which will be of direct assistance to the company in ultimately making the lowest rate possible to even the smallest consumer. This method of determining rates is now being accepted by the Public Service Commissions as correct in principle, and is being advocated by them. Those gas companies that have adjusted their schedules in this direction have, in every instance where correctly adjusted, realized important advantages. The adoption of properly determined step rate schedules, will place any gas company on the direct road to maximum sales of gas and the maximum net earnings possible; while, at the same time, working directly in the interests of the community served by bringing about the lowest average selling price that the conditions of the community justify.

Late Developments in By-Product Coke Ovens.[1]

By William H. Blauvelt.

At the meeting of the Institute in New York a year ago the status of the by-product oven in America was ably presented and the interest with which that paper was received encourages me to bring to your attention some of the latest developments in this industry, which is becoming of such importance to the iron and steel manufacturer. In 1913 the tonnage of by-product coke amounted to 12,714,700 tons, or over 27 per cent. of the total coke produced in the country. This is an increase of about 1,600,000 tons over 1912, and it is probably safe to prophesy that by the close of the current year the production will be at the rate of 14,000,000 tons. Compared with 1910, this means a growth of 100 per cent. for 4 years. From the United States Geological Survey reports it appears that the average value of the coke and by-products obtained per by-product oven in 1912 was $11,265, as compared with $1,019 as the average yield per bee-hive oven. The total value of the by-products recovered was over $16,000,000. If the by-products had been recovered from the coal used in making coke in bee hive ovens, they would have been worth approximately $80,000,000 – at the prices ruling in that year. The average yield of coke from by-product ovens was 75.3 per cent., and in bee-hive ovens 64.7 per cent., a difference in favor of retort ovens of 10.6 points, or 16.4 per cent. If this difference had been added to the production of bee-hive coke it would have added to the wealth of the country 5,390,000 tons of coke if the same coals had been cooked in by-product ovens, in addition to the above value of the by-products. This loss is equivalent to the absolute destruction of about 6,800,000 tons of our coal supply during the year. I give these figures as suggestive of the importance of the by-product oven in the conservation of our natural resources. In this connection it is interesting to note that recent work in some by-product ovens is showing conclusively that the high volatile coals of the Connellsville and Klondike districts make by-product coke quite equal to the best coke that can be made in bee-hive ovens from these coals. The distribution of the 42 by-product coke plants in the United States is such that in almost every case they are located at the point of consumption rather than at the coal mines, as distinguished from the almost universal practice with regard to bee-hive plants. In the five coke-producing States of the South the percentage of by-product coke is much larger than in the country as a whole. With the completion of present construction nearly half of the coke made in the South will be by-product coke. This point is worthy of consideration in connection with the work the Southern States are doing in the conservation of their resources.

One of the most notable improvements which has been made in the industry since its introduction into this country is the increase in output per oven unit and per man employed. When the first ovens were brought over from Europe they had a capacity of 4.4 tons of coal per day, and one crew of men was capable of handling about 25 ovens. This gave a capacity of 110 tons of coal per day with a unit crew. To-day the most modern ovens have a capacity of 20 tons of coal per day, and improved organization and modern machinery permit practically the same crew to handle from 50 to 60 of these ovens, thereby coking from 1,000 to 1,200 tons, instead of the original 110 tons. I know of none of the other metallurgical industries which has shown the same growth in tonnage efficiency in the same time. This is a conservation of labor well worth consideration along with the conservation of our coal supply. Progress in this respect has been distinctly greater in America than in Europe.

The by-product oven has been developed along two lines; the waste heat oven, and the oven recovering the maximum amount of surplus gas. The former is the simpler type, and is ordinarily installed in places where the gas has little value.

With the growing use of machinery for the storage and preparation of coal and for the preparation of coke, and the substitution of machinery for hand labor in other parts of the process, the requirements for power have grown materially, so that the amount of power required for a modern coke oven plant is very considerable. There are many cases where the most economic results are obtained by a plant so designed that there is just enough heat in the waste gases to supply the steam required for the operation of the plant, leaving the remainder of the gas available for sale to nearby consumers.

A boiler plant properly designed for waste heat, with its accompanying economizers for preheating the feed water, is the most economical apparatus for utilizing heat in an industrial plant; that is, such a boiler plant will deliver the gases to the chimney, or to the exhaust fan which often replaces the chimney, at the lowest possible temperature consistent with commercial results. Such a design permits a very simple type of oven, with low first cost and low cost of operation. In the type of oven with which I am most familiar, the Semet-Solvay oven, these principles have been thoroughly developed, and under the conditions described above very satisfactory results have been obtained. Fig. 1 shows the arrangement adopted in the construction of this oven.

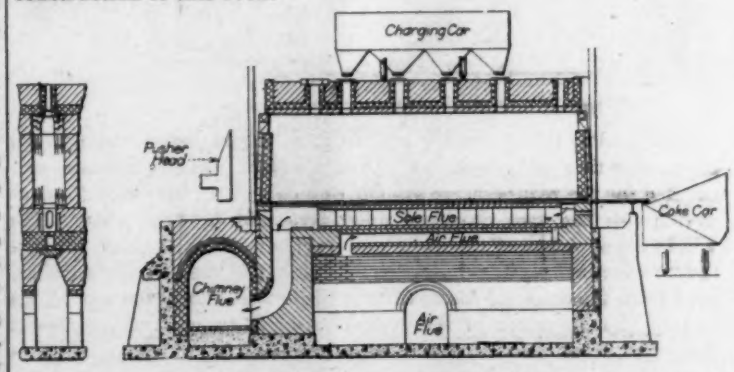

Fig. 1.—Simple Form of Waste Heat Oven.

The gases are burned in the combustion flues shown, and then passed to the sole flue beneath the oven and out through the chimney flue to the boiler plant. The air for combustion passes first under the sole flue and then through the narrow flues on each side, where it comes into intimate contact with the heated brickwork, thence upward to the heating flues, where it meets the gas. By a proper proportioning of these parts enough heat is abstracted by the air from

1. From a paper prepared at the American Iron and Steel Institute.

the waste gases so that the highest temperatures may be produced in the combustion flues, and at the same time sufficient heat remains in the waste gases to produce all the steam required for the operation of the plant, without any expense for fuel or for labor in firing. By this system something over 40 per cent. of the gas is available as surplus. This system requires no attention from the operators except the regulation of the air at the burners and the maintenance of proper water supply to the boilers. This method of heating the air is called "recuperation" to distinguish it from the familiar form of regenerator common to most high temperature furnaces.

In Fig. 2 a more efficient form of recuperator is shown, modeled

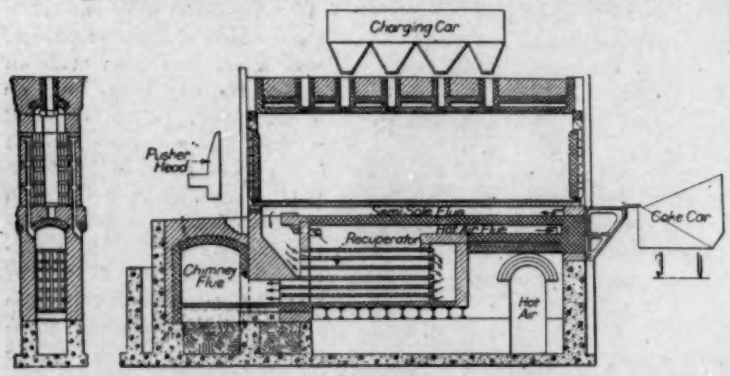

Fig. 2.—Waste Heat Type of Oven with Recuperator.

somewhat after the recuperative glass furnaces, which are successfully used in Europe. In this oven the hot gases pass through the recuperator flues, making two passes on their way to the chimney, and the air rises through the small vertical flues arranged in the special brick used to build up the recuperator. It is manifest that there are many cases where this type of oven, with its low cost of construction and simplicity of operation, has important advantages.

In plants where there is a demand for all of the available surplus gas at a good price, it is, of course, desirable that the oven should be designed to use the smallest amount of gas for fuel, even though the chimney losses are greater, and the cost of producing steam for the plant is increased. It is clear that there is a dividing line which must determine the selection of the best type of oven for any given installation, and that all the factors entering into the undertaking must be given due weight before either kind of oven is finally adopted.

Fig. 3 shows an oven designed to operate with the smallest amount

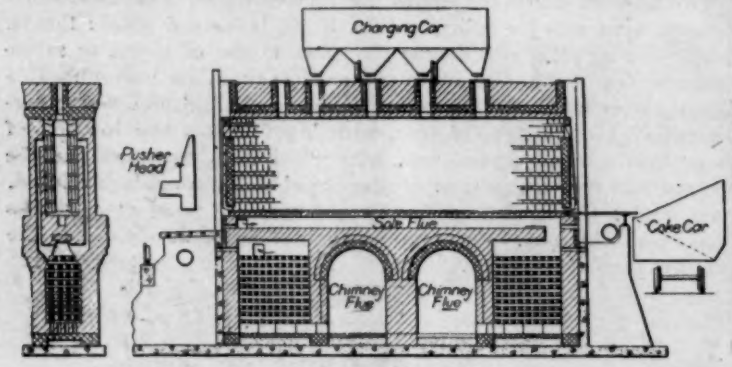

Fig. 3.—Surplus Gas Type of Oven with Recuperators.

of fuel, and at the same time maintain, as far as possible, simplicity of construction and operation. In this design regenerators are substituted for the recuperative system, one pair of regenerators for each oven, with the two chimney flues arranged between them. The whole construction of the oven and regenerator is located between the two vertical walls peculiar to this type of oven. These walls extend from the concrete foundation straight through to the top of the oven. The operation of the regenerators is, in general, similar to that of an open-hearth furnace, except that an entire block of 60 or more ovens is reversed at one operation, as will be described later. The air is usually blown in by a fan located beyond the reversing damper and is distributed under the block through one chimney flue. It enters at the bottom of the regenerator, rises and passes through the flue system, meeting the gas at the several burners in the combustion flues. On reversal, the air enters the other regenerator, rises through the air flue, shown in dotted lines, and descends through the horizontal combustion flues, meeting the gas as before. The products of combustion pass out through the other regenerator to the reversing damper and stack in the usual manner. By this system the entire series of combustion flues are swept by all of the air required for combustion, so that hot spots are prevented and a very uniform temperature is maintained throughout.

Any one familiar with the use of the high temperatures required in metallurgical work will realize the difficulties connected with the proper heating of a by-product oven. The walls of the chamber are, say, 36 feet long and about 12 feet high. Every portion of both of these chamber walls must be heated to a high temperature, and the temperature must be uniform in all parts, excepting that perhaps the upper part may be somewhat cooler. Any inability to control the temperature at any portion of this surface (about 430 square feet) means the production of imperfect coke, delay in operation, or injury to the brick work. The method used in controlling the heat over this surface is shown in Fig. 4 in diagrammatic form. The air,

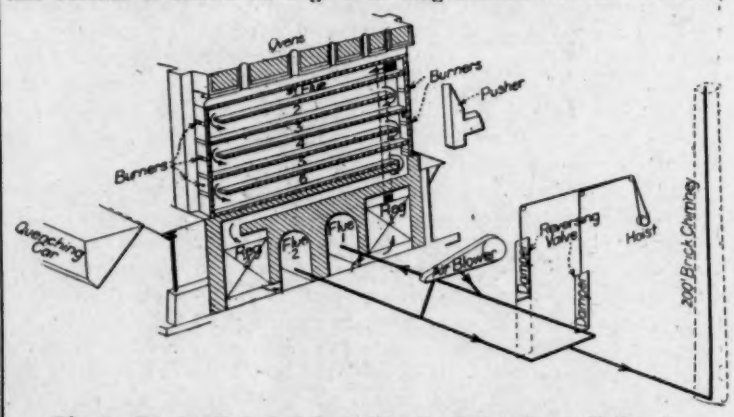

Fig. 4.—Showing Method of Controlling the Heat to Secure Uniformity.

raised by the regenerators to a temperature of about 1,000° to 1,100° C., travels through the flue system, as above described. At the ends of the flues are shown gas burners, consisting of simple pipes, which admit the gas. When the air is traveling downward through the system it flows through the first flue until it reaches the first gas burner shown at the right. The stream of gas is deflected downward by the air current and burns in the air as it travels through the flue. At the end of the second flue the air meets another stream of gas, which is deflected downward and heats the third flue, and so on, until the gas from the last burner consumes the last of the oxygen. When the air current is traveling upward the streams of gas are deflected upward, so that the entire combustion system is reversed at the usual half-hour periods by the manipulation of only one reversing damper for the entire block of ovens. A proper adjustment of the relative amount of gas delivered by each of the burner pipes maintains just the right relation between the heats in the different parts of the system, with the minimum attention. This method insures the most even distribution of heats throughout the whole heating system. It seems clear also that in the practice of passing the whole volume of air required for the combustion through the entire flue system there is a gain in efficiency of transfer of heat from the hot gases to the oven walls, as compared with the older methods of heating.

There has been some discussion as to whether the heating of a by-product oven is affected by radiant heat or by convection and conduction, but I believe that the arguments are distinctly in favor of the latter theory. Under the conditions which exist in a coke oven the brick wall, at working temperatures, is a good conductor of heat. This is illustrated by the fact that an increase of the thickness of this wall from 2½ to 4½ inches does not demand in practice a higher temperature in the flues to produce the same result in the coking chamber. The flame as burned in the oven flues is only slightly luminous, and it has been shown by good authority that the radiation from a non-luminous flame is only about one third of that from a luminous flame. Moreover, since radiant heat is transferred in accordance with the difference between the fourth powers of the temperatures of the radiant and receiving bodies, while heat is transferred by conduction proportionately to the first power of the difference in temperatures, it would seem clear that under the conditions we are considering, at least a large portion of the heat transferred from the hot gases to the flue walls must be by convection and conduction, and the system which uses this latter method is the more efficient.

In a system of heating flues where the layers of gases lying next to the walls are practically stationary or moving slowly, it has been

shown by experiment that these layers of quiet gases form an effective non-conductor which offers a greater obstacle to transfer of heat than the degree of conductivity of the wall itself. When the flow of gases is sufficiently rapid to sweep away these quiet layers the hot gases are permitted to come in direct contact with the walls and transfer their heat to the substance of the wall according to the first power of the difference in temperatures, and the efficiency of the transfer is proportionately good. The comparative rapidity of flow of the gases during their combustion also has the practical value of distributing the heat and preventing injury to the brickwork, avoiding thereby the dangerous condition which arises in an operation where temperatures are generated approaching the melting point of the refractory material.

Turning to the diagram it will be seen that each burner is directly under the hand of the man in charge of the heats as he walks in front of the ovens, and each flue may be inspected at a glance by the removal of a plug from a peep-hole. The importance of convenient access to the control of the gas supply and to the inspection of the heating flues in a block of by-product ovens cannot be stated too strongly. With a given coal, the quality of the coke produced depends very much upon the maintenance of the proper temperature in the oven, not only as a whole, but in every part, since nothing injures the quality of the coke more effectively than inequalities in the heat in different parts of the chamber, so that certain portions of the charge are over-coked while the cooler spots are being finished. In an industrial plant it is essential that any important operation shall be done conveniently and in comfort to the operator, otherwise one may be sure that it will be done badly except under the closest supervision. Given good construction and simplicity of parts, the oven which permits the most convenient and accurate control of the heats is the best oven.

The Determination of Ammonia in Illuminating Gas.[1]

By Mr. J. D. Edwards.

This paper is a summary of the results of a brief investigation of the apparatus and methods employed for the commercial determination of ammonia in illuminating gas. A fuller report will be found in Bureau of Standards' *Technologic Paper* No. 34, and the application of this work in the form of operating directions for carrying out the determination will be included in Bureau of Standards' *Circular* No. 48, "Standard Methods of Gas Testing."

The method generally used for the determination of ammonia in purified illuminating gas depends upon the absorption of the ammonia in a standard acid solution, the amount of ammonia absorbed from a measured volume of gas being determined either by titration of the acid remaining unneutralized, or less frequently by allowing the gas to pass until the change in the indicator used shows that all the acid has been neutralized. The choice of the proper indicator to use for this determination is of greater importance than the choice of apparatus, since the use of an unsuitable indicator may introduce large errors, amounting in extreme cases to more than 100 per cent. Many indicators have been and still are commonly used which are not at all suited to the purpose, failing to meet one or more of the following essential requirements:

1. It should show a sharp end point in dilute solutions.
2. It should be sensitive to ammonia and not be seriously affected by ammonium salts.
3. The end point should be affected as little as possible by carbon dioxide.

The indicators found to be most suitable were sodium alizarinsulfonate, cochineal and paranitrophenol. Sodium alizarinsulfonate is less sensible to caron dioxide than either cochineal or paranitro phenol and gives a color change from greenish yellow to brown which is quite sharp even with very dilute solutions. Sodium alizsrinsulfonate was the indicator used in the remaining experimental work. Methyl orange, though less sensitive to carbon dioxide than the above indicators, does not give sufficiently sharp color changes with weak solutions. Phenolphthalein and litmus, of course, are too sensitive to carbon dioxide to be of use here.

The glass beads which are used in some of the absorption apparatus may lead to erroneous results for two reasons: (1) The beads may yield alkali on contact with the absorbing liquid; (2) washing of the beads may be incomplete. Although the absolute amount of alkali which might be dissolved from the beads is small, it may be equivalent to a considerable percentage of the total amount of ammonia to be absorbed. For this reason, it is recommended that the operator test the solubility of any beads he may use The method of washing out the apparatus should also be tested to insure complete washing with a minimum of wash water.

Five different forms of apparatus were tested: The Referees apparatus; the Emmerling tower; the Lacey apparatus; the common form of gas wash bottle; and a modified form of the Cumming wash bottle. This latter (Fig. 1) was designed at the Bureau of Standards for this work. In this form, the gas passing through the small nozzle acts like an injector and circulates the liquid rapidly and continuously, thus bringing fresh acid into contact with the gas.

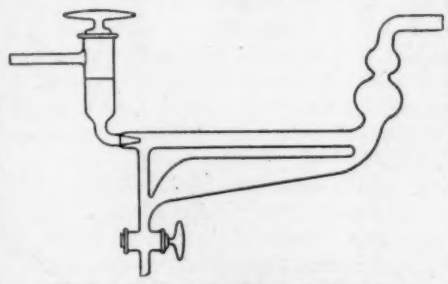

Fig 1.—Modified Cumming Wash Bottle (One-fourth Size.)

The relative efficiency and from this the probable accuracy of the different forms of apparatus was determined by running the different forms in parallel, using gas from a common supply. A *N*/50 solution of sulphuric acid was used as the absorbing agent. It was not considered desirable to use a stronger solution than this because of the small amount of ammonia to be absorbed and the fact that small errors in the measuremeut of stronger solutions make a large error in the ammonia apparentely absorbed. From these comparisons it was found that the Emmerling tower gave results somewhat higher than those obtained with the other forms, and that the wash bottle gave results consistently lower.

In a series of 10 tests, in each of which four different apparatus were run in parallel, the maximum difference between the high and low results of each test (expressed as a percentage of the average) was 8.3 per cent. and the average difference 4.5 per cent. The ammonia content of the gas was varied from 1 to 20 grains per 100 cubic feet. For full experimental details see *Technologic Paper* No. 34, above referred to.)

A series of tests in which the gas after passing through the first absorption apparatus passed through an Emmerling tower, showed, in general, that the amounts of ammonia escaping the first apparatus but absorbed in the Emmerling tower were not detectable within the limits of error of the titration.

With careful operation any one of the five forms of apparatus tested would ordinarily give results well within the limits of accuracy required for this determination, either for commercial control work or for the purpose of gas inspection. The w ash bottle appears to be slightly less efficient as an absorber than the other forms, but still it gives satisfactory results. It is difficult to make any comprehensive statement defining satisfactory results. In general, results on gas containing up to about 5 grains of ammonia per 100 cubic feet should be within 10 per cent. of the ammonia content of the gas, although the percentage error may be greater when the ammonia is 1 grain or lower. With gas containing more than 5 grains ammonia, the percentage error should decrease somewhat.

1. From a paper presented at the Cincinnati Meeting of the American Chemical Society.

Utilization of Gas Appliances in the Wholesale Preparation of Food.

[From a paper by Mr. Ivan A. Hoy, read before the Illinois Gas Association.]

The hotel and restaurant activities of a gas company really extend over a much larger field than that indicated by the names hotel and restaurant. Apparently it has been a general impression among gas men that hotels and restaurants were the only fields which promised profitable business in this branch of our operations. In order to cover the field completely, every business where food is prepared for the public, should be considered as hotel and restaurant work, and handled as such no matter what the name of the business. Unless this arrangement is affected and followed up it will result in the smaller places not receiving proper attention. Saloons serving free

lunch, and delicatessen stores are just as important in their field as any hotel or restaurant no matter how large the latter may be. In handling the subject, therefore, from the gas company's standpoint, I believe the first step to be taken is to classify the kind of business and determine what classes shall be considered under this head, and then hold this division accountable for the results obtained.

When viewed from this standpoint, the hotel and restaurant field covers every place where food is prepared for the public either in wholesale or retail quantities. On this basis the following named places fall in this class:

1. Hotels,
2. Restaurants.
3. Lunch Rooms.
4. Lunch Clubs.
5. Chop Suey Houses.
6. Private and Public Clubs.
7. Hospitals.
8. Institutions.
9. Churches.
10. Delicatessen Stores.
11. Bakeries.
12. Saloons.
13. Public Schools.
14. Boarding Houses.
15. Cafes.
16. Rooming Houses.
17. Cafeterias.
18. Tea Rooms.
19. Employes' Dining Rooms.
20. Public Halls.
21. Pool Room Lunch Counters.
22. Summer and Winter Gardens.
23. Lodge Halls.
24. Amusement Parks.
25. City Park Refectories.
26. Billiard Halls.
27. Dept. Store Restaurants.
28. Railroad Terminal Eating Places.

Care must be taken to see that the salesmen do not sell one class of goods only, and neglect other styles of appliances. On account of the ease with which the men fall into this habit, it is advisable to analyze the field for the purpose of measuring progress and locating failures. An analytical test of this kind in Chicago disclosed the fact that most of our energy was being expended on hotel ranges, to the exclusion of some of the other important appliances. For instance, while we had sold a great many of the ordinary type of circulating water heaters for restaurant work, our sales on the larger units were limited. We discovered that we were paying almost no attention to the major field of water heating which should be taken care of by automatic instantaneous water heaters and automatic storage systems.

This condition led us to the following subdivision of the hotel and restaurant field:

Cooking, Water Heating,
Baking, Space Heating,
Specialties.

Arranged in the form of an outline, with their corresponding appliances, they appear as follows:

HOTEL AND RESTAURANT DIVISION.

- *Cooking.*
  - Ranges,
  - Broilers,
  - Cake Griddles,
  - Steam Tables,
  - Coffee Urns,
  - Roasting Ovens.
  - Steam Boilerss,
  - Chop Suey Stoves,
  - Plate Warmers,
  - Stock Boilers.
- *Baking.*
  - Bake Ovens (Stationary).
  - Bake Ovens (Reel).
  - Doughnut Fryers.
  - Boiling Stoves.
  - Steam Boilers.
- *Water Heating.*
  - Circulating Water Heaters.
  - Self Contained Tank Units.
  - Auto Instantaneous.
  - Multi-Coil Storage Systems.
- *Space Heating.*
  - Space Heaters (ordinary).
  - Natural Gas Heaters.
  - House Heaters.
  - Gas Water Radiators.
  - Gas Steam Radiators.
- *Specialties.*
  - Incinerites.
  - Clothes Dryers.
  - Gas Refrigeration.

The first year after this classification was made our sales on automatic water heaters were double that of any previous year, affected simply by giving proper attention to the subject, and it did not in the least affect the amount of business secured on other appliances.

Continuous endeavor in any field is always accompanied by varying situations which must be met and handled. In connection with hotel and restaurant work, the question of policy is always to be considered. New conditions are constantly arising which call for decisions, and these must not be made without due consideration. Policies which seem correct at the time they are adopted, are, because of changes in conditions, very soon antiquated and must be supplanted by new methods. In the early stages of this work in Chicago, it seemed that the way to get started was by means of a well defined campaign of direct-by mail advertising. We soon discovered, however, that we had nothing to tell the customer except the story of the appliances themselves, and this was not sufficient. We needed definite information on what the appliances would do after they were installed. When this condition was discovered we at once discontinued advertising, increased the force of salesmen, and began a strenuous personal campaign. This campaign has been on for two years and as a result we have hundreds of successful installations of all kinds of appliances, to which we can refer prospective customers. Now that we have something to tell, we are arranging to send out special advertising matter which will herald the success of our appliances. We expect to show the small expense for repairs, the large amount of work accomplished and the small amount of gas required in performing this work. We believe that this will be live and interesting reading for the prospective customer; also that it will assist very materially in removing from his mind the large question mark regarding the advisability of dealing with the gas company, when he wishes to buy economical gas appliances.

One important policy in connection with this work is that which concerns the relation with competitors in the sale of gas burning equipment. One does not need to make a very extensive investigation to discover that the average hotel equipment concern, in building gas burning appliances, pays very little attention to the design and construction of the burners. In this respect the best that they can do is usually only an imitation of equipment handled by the gas company, and they usually fall far short of giving the customer as economical appliance. While I believe that we should endeavor to be on friendly terms with these manufacturers, it is a very delicate situation, for the reason that the gas company cannot afford to endorse such appliances. It sometimes happens that such manufacturers will sell a complete kitchen outfit and then, with the customer, request the gas company to install it. If the company complies, their act of accommodation places a stamp of approval on the appliances, and if any subsequent dissatisfaction arises the gas company rather than the manufacturer is blamed. This kind of a result hurts the cause of fuel gas, and at the next opportunity the manufacturer will not hesitate to make capital out of it, even to the extent of selling coal appliances. It seems to me the ideal condition would be for us to assist these manufacturers in developing economical gas appliances. These manufacturers use the same selling arguments in regard to economy of gas that the gas company uses, even though their arguments have less merit. The customer is more inclined to believe their story simply because they cannot comprehend why the gas company should advise the use of the most economical appliances obtainable.

The old idea of selling gas was to load the customer with as many gas appliances as possible; and apparently the more gas they burned, the better pleased we were. This idea is absolutely wrong, and the sooner we begin canvassing our present customers to see if we can reduce their gas bills, the sooner we will make our customers our friends. Of course we want our customers to buy as much gas as they can use advantageously, but it is bad advertising for us to have a customer pay for gas which is wasted. Our watchword should be "more work with less gas." Showing a consumer how he can do a given amount of work on less gas than he is using, makes him such a friend of the gas company that he unconsciously becomes our salesman. He will assist us in inducing people who are using solid fuel to change to gas.

No man can continually withstand intelligent persuasion, and if our representative call on any man enough times, it is a safe bet that this man will become our customer. The question of solicitation can hardly be given too much thought. It is not fair to assume just because we have gas to sell that everybody who ought to use gas will of his own volition ask us to supply his needs. A man's own business is always of prime importance and claims his attention first. The burden of proof, therefore, rests upon us to show how and why he needs our product in his business. Our salesmen have a double duty to perform. First, to market our product, thereby furthering our business; second, to adapt our product to the customer's business, so that the result will be advantageous to him. The attainment of these results in our mutual benefit. The territories should be of such size that the representative in each will have time to call on each prospect at least once every 30 days. We want everyone to become accustomed to having gas men call at their places of business. Everybody should burn gas, and if they do not, it is our fault, not theirs.

Many argue, and have some grounds for argument, that every re-

quest from a public eating place should be handled by the same gas company man, no matter whether the request be for light or fuel. While the writer is willing to admit that there may be some advantage in having the fuel expert handle the lighting propositions, there are good arguments against this method of precedure. If you expect your fuel expert to handle the lighting questions with any degree of accuracy, it would necessitate his being as nearly as possible a finished illuminating engineer. If this idea is adopted and followed out, you are doubling the load which your man must carry and I believe that in this day of specialization better results can be accomplished by having experts in each line, than by expecting one man to become expert in all branches. In view of the foregoing, I strongly recommend that competent men be secured for the hotel and restaurant branch of the business, and that they become experts on the subject of fuel, no matter what kind of an appliance, or for what purpose this fuel is to be used. I believe you will agree with me that a man can more nearly become an expert on the fuel qnestion if you relieve him of the responsibility of collecting and carrying up-to-date illuminating data, than if you compelled him to work up both subjects and carry the latest information all the time on both questions.

The lighting propositions can easily be taken care of by having the fuel man introduce the lighting engineer, thereby giving him the benefit of his acquaintance with the prospective customer. If this situation is handled in a judicious manner, the customer will feel complimentod that the fuel man has been so frank as to admit his shortcomings on illuminating engineering; and unquestionably, will have greater confidence in both men under this arrangement, than if one attempted to handle both subjects.

I believe that the kind of business ought to determine whether a certain piece of busines should be called hotel and restaurant or domestic, rather than having it determined by the kind of appliance to be installed. This is advisable because in certain places it may be found that a domestic appliance is perfectly suitable for the work, in which case it would be an injustice to the customer to insist upon his purchasing a hotel appliance. When the propositions are handled with this idea in mind, it devolves upon the expert fuel man to recommend to his customers an appliance which will do the work satisfactorily. This condition can be handled by the man on the job because he knows all the local conditions before he makes his recommendation. If the customer's proposition really requires a heavy appliance, this man will refuse to sell a domestic one, and will recommend the appliance which will be satisfactory. On the other hand, if a heavy appliance is not adapted to the particular place he can recommend a domestic appliance. In either case the customer will feel that his situation has been given proper attention, and that he has the reliability and the best judgment of the company to support his action. I believe that hotel and restaurant orders should be closed by these salesmen only. They are the best judges as to whether a certain appliance is suitable for the work it will be expected to perform. It is better to get no order than to sell the wrong appliance. The customer's judgment cannot be relied upon, and therefore, he should not be permitted to pick out the appliance. There is a great difference between selling the customer an appliance and allowing the customer to buy an appliance. Much of the dissatisfaction with gas as a fuel can be traced to the installation of the wrong appliance. The finer judgment as to the fitness of a certain appliance can not be exercised by a sample floor salesman, and for that reason he should not be allowed to close an order. One of the best ways of assisting a salesman is to provide him with plenty of photographs. There is no better way of securing the attention of a prospective customer than by showing him photographs of installations. While they are being examined, the story of the installation and results obtained may be given with great effectiveness. Much business has been secured in Chicago by means of photographs, without which an interview would have been denied. Every salesman should carry a photograph of every appliance he has for sale and also of every important installation. Photographs get the attention. The daily morning session with the salesmen is a very important feature of solicitation. It affords an excellent opportunity of keeping in touch with their activities. New appliances and special propositions can be discussed. The experiences of the previous day are both interesting and instructive. The slogan of the meeting might be, "If you closed an order, how? If you did not, why?"

Securing Business.—It is not enough for us to know that our appliances will do satisfactory work for our customers. It is due the customer that we show him that we can be of benefit to him. If this cannot be accomplished by referring to similar installations in the same line of business, a trial installation in his own place will soon convince him of our claims. We find in Chicago that when we are reasonably sure of our results it pays to make trial installations. This gives the customer the best possible data. He knows then of his own knowledge if our appliances are satisfactory. If due consideration is given to each case, the trial installation policy is not as hazardous as one might imagine. In two years we have had removals in only two cases.

The public expects the gas company to be up-to-date in its methods. The automobile has become such a factor in commercial activities that it is almost indispensable in our line of work, especially in large cities. If a salesman is unable to convince a customer of the truthfulness of his statements, very frequently a few words of conversation with a man who is using similar appliances are convincing. The automobile affords comfortable transportation with a minimum loss of time for prospective customers to visit and inspect installations. Busy men are loath to leave their business to investigate our claims, but if these visiting trips can be accomplished in an hour or two, the customer will seldom refuse to go. For this reason the automobile is often the deciding factor in an order. Much business these days, in every line, is conducted on personal friendship. This is true to such an extent that it becomes almost imperative that our salesman make himself a personal friend of every man in his territory who is in a position to use our product. If we fail to cultivate this personal friendship, either the man does not use gas for fuel at all (in which case his friendship may be traced to the coal man), or he becomes a personal friend of someone else who manufactures and sells gas appliances. Since this condition exists it ought to be the aim of every hotel and restaurant salesman to make himself such a personal friend of his customers that they cannot think of buying a stove without simultaneously thinking of our salesman. It is probably unreasonable to suppose, no matter how active we are, that it would be possible for us to sell all the hotel appliances installed. We will have very much less regrets, however, if we have an opportunity to give the customer the benefit of our judgment, even if we lose his order, than we would if the customer makes his purchase before we are advised of the conditions. The salesman ought to know his territory and his people so well that he will know of every job before it is installed, whether we sell the appliance or not. Promptness in installing wins us a great deal of friendship. No man likes to have the installation of his appliances delayed. If he is promised that the installation will be made at a certain time, the work should be done as promised. We should either keep our promises to the public or make none. Soliciting for this kind of business is hard work. When a salesman makes such progress with the customer that he is able to get an order for an appliance, certainly the least the company can do in backing up the salesman is to execute the order promptly and, thereby, assist him in keeping his word with the customer. The writer has in mind one installation which was promised for between 8:30 on Saturday night and 6 o'clock Monday morning. You can imagine the surprise of the chef and the manager on returning to their work Sunday morning to find the installation completed. Completing this job 24 hours sooner than promised gave us a better standing with them than anything else that could have been done at that time. It resulted in the customer starting out with our new appliance in a very friendly frame of mind.

Holding Business.—The question was asked why so many hotel installations were made and subsequently removed. So far as I know, it was never answered through the magazines. The writer answered it in his own mind giving two causes, as follows: The appliances were not adapted to the work they were called upon to perform; and the proper check was not kept on the amount of gas consumed. It is not consistent with good business practice to use gas unreservedly without noting the amount of the daily purchase. In the case of a hotel kitchen, for instance, every article of food that is brought into the kitchen is checked with extreme care to determine if charges are correct and if the proper amount is received. I believe that it is pure negligence on the part of the customer not to check his daily gas purchase in the same way. I strongly recommend daily reading of the meter and having a record of the amount of gas consumed each day placed on the manager's desk for his attention the first thing each morning. This keeps him posted as to the gas consumed, and if any irregularities occur, he can check it up at once. The suggestion of reading the meter daily is accepted readily by our customers and they appreciate fully the advisability of keeping a daily record, when it is once brought to their attention.

(*Continued on page* 394.)

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DEATH OF THOMAS DOLAN.

Thomas Dolan, ex-President of the United Gas Improvement Company, and for many years a commanding figure in the financial activities of Philadelphia, died on June 12th, at his summer home in Torresdale, at the age of 79 years. Although failing in health for two years, it was only during the last two days that the family expected his death.

Mr. Dolan was born in Montgomery County, Pa., October, 1834. He was educated in the common schools of that county, and sought employment years before the average youth has made even the commonest scholastic advancement. He had been an apt scholar; the same indomitable perservering spirit which marked his later years as a manufacturer and financier aided him in his studies and his early business career. He became a clerk in a retail dry goods store in that city, and applied himself so earnestly to the business that when at the age of 22 years, he secured a connection with a large commission house, handling hosiery from England, he was a well-trained, sagacious man of business, with a propensity for driving good bargains and of undoubted executive ability.

During the depression incident to the Civil War, the firm failed. Mr. Dolan for a time was out of employment. Then he conceived the idea of going into business for himself, and in 1861 he embarked in the business of manufacturing knit goods. The ensuing 5 years of civil war brought marked prosperity to the business, known as the Keystone Knitting Mills, and placed him upon a substantial footing. Later he formed the firm of Thomas Dolan & Company, to manufacture worsted suiting, which business in 1897, when Mr. Dolan retired from it, was employing 4,000 men.

At 63 years of age—almost the 7th age of man—this veteran of labor turned his thoughts to broader fields. With intuitive perception he realized the wonderful value of electricity in its commercial relation. He organized the Brush Electric Company in Philadelphia, Baltimore and New York, and proposed electric lighting for the streets of Philadelphia. The plan was opposed as impractical. The objections voiced by the municipal authorities and the people gave Mr. Dolan an opportunity to show the stern stuff of which he was made. He offered to light Chestnut street from the Delaware to the Schuylkill rivers at his own expense for one year. If, at the end of that time, the experiment failed, he would take down the poles and wires. The experiment was a success. Chestnut street was lighted, Market street was lighted, and eventually the entire city. But Mr. Dolan was not done. He looked far into the future and thought out the great financial triumph of his life. In 1886 he formed the conviction that the Philadelphia gas works should be leased to private capital, and submitted a plan for a lease to a syndicate of which he was the head, but after much controversy the effort failed.

In 1892 Mr. Dolan became President of the United Gas Improvement Company; and in 1897, after a long period of wasteful municipal management, the city works was leased to Mr. Dolan's company.

Mr. Dolan was also a power in the street railway situation, being the silent partner of the Kemble-Widener-Elkins combination that absorbed the Philadelphia traction companies, and afterward acquired the Broadway lines in New York, and established the Metropolitan system. Next they entered Chicago acquiring the street railways and gas and electric companies, and then into Baltimore and Pittsburgh.

It would be a large task to narrate at length the many business affiliations of Mr. Dolan. He was connected with Philadelphia's leading financial institutions, the Philadelphia Electric Company, and the School of Industrial Art. He was at one time president of the National Association of Manufacturers, and was an organizer and the first president of the Manufacturers' Club. He was one of the first members of the Union League and a vice-president of that club for a number of years.

On March 16, 1912, Mr. Dolan resigned the presidency of the United Gas Improvement Company. His great brain was as active then as when he opened business for himself at 22 years of age, but his physical strength was giving way under the weight of years. When his resignation was announced to the shareholders of the company at the annual meeting that year, C. Stuart Patterson, his friend of half a century, outlined the wonderful growth of the corporation under Mr. Dolan's management, and in a peroration asserted that it was due only to the fact that the head of the concern was a man of great courage, sagacity and intelligence, who could see far into the future and who could attract to himself men who could carry out his plans. Not only did Mr. Dolan attract great men to his aid in his business ventures, but his associations with the Widener-Elkins interest in New York traction affairs gave him national prominence which will live long. Yet, withal, he was a man of simplicity, whose rule of life was to make every one happy, to be just in his judgment, and to aid in the advancement of those below him. He is survived by his widow and 3 sons.

THOMAS NEWBIGGING DEAD.

Thomas Newbigging, whose name has for many years been a household word in the gas industry, died on June 1st at his home in Knutsford, England, at the age of 81. Mr. Newbigging entered the gas business in 1851, and has been prominent in the industry continuously since. He was England's best known gas engineer, one of the founders of the British Association of Gas Managers, and a voluminous writer on technical matters and subjects of a literary character. In 1870 he published the first edition of his "Handbook for Gas Engineers and Managers," which was and will continue to be of great educational value to the gas industry, and one of his monuments.

BRIEFLY TOLD.

Society of Gas Lighting.—The June meeting of the Society of Gas Lighting was on the 11th inst, at New Haven, Conn., Messrs. Nettleton, Norcross and Wyant acting as hosts. The members were met on arrival at New Haven and taken by automobiles to the Quinnipiac Club for luncheon. After lunch the party visited the works of the New Haven Gas Light Company, where a couple of hours were spent looking over the new 2,000,000 vertical retort plant. Then a drive was taken to Cox's Surf House at West Haven, where a New England shore dinner was enjoyed, closing a delightful days's outing.

Mid-Year Conference, National Commercial Gas Association.—The second day's session (June 12) of the Mid-Year Conference, N. C. G. A., was given over to a general conference in the auditorium of the Engineering Societies' Building. The morning meeting was called to order by President P. S. Young, at 10 o'clock, and opened with an address on "Education," by Dr. A. C. Humphreys, President of Stevens Institute of Technology. Dr. Lee Galloway, Director of the N. C. G. A. educational work, spoke briefly on that subject, as did

also Mr. R. F. Pierce, Chairman of the Board of Educational Control. The first paper read was that of Mr. R. C. James, on the "Organization of the Sales Department of a Gas Campany," which developed a spirited and interesting discussion. The afternoon session was started by Mr. H. W. Brown's paper on "Scientific Management as Applied to the Sales Department." At the close of the discussion announcement was made of the death of Mr. Thomas Dolan, and on formal motion the Board of Directors were instructed to prepare suitable resolutions thereon. The first short topic taken up was "The Gas Company's Relations with Architects," presented by Mr. L. R. Dutton, Chairman of the Committee on Home Equipment." This subject brought out such a volume of discussion that there was time for but one other topic, "Operation and Results of Circularizing Departments." introduced by Mr. J. P. Hanlan, and discussion on this was cut short by the adjournment. All told, the conference was a great success and well attended, and the importance of the subjects treated thoroughly appreciated. One comment heard was to the effect that a visitor to the session in the Consolidated Gas Company's Auditorium, would have thought he was in a meeting of metallurgists or factory managers, rather than a gathering of commercial gas men. It was truly a demonstration of the great change in calibre of the men in the commercial departments and an indication of the broad field that the industrial man has to study.

MR. AMBLER AN ANSWER.—At the convention of the National Association of Corporation Schools in Philadelphia Mr. T. M. Ambler, of the Brooklyn Union Gas Company, was one of those selected to discuss a paper presented by Mr. L. N. Denniston, in which he "shied a brick" at the man of "generous dimensions." Mr. Ambler said in part:

When first asked to discuss Mr. Denniston's paper, it seemed an easy task, but like a good many other things that appear easy because we really do not know anything about them, the more thought I gave to the subject, the less I found I knew; and about that time I was very much tempted to recall my rash acceptance and withdraw altogether from the discussion, because in making a résumé of my business experience I found that the selecting of men was only incidental with me, while with Mr. Denniston it seems to have been the chief factor.

My experience may have extended over a longer period, but I am sure Mr. Denniston's has been much more extensive. With him his few failures seem to have made the more lasting impression; with me the few successes are the ones most readily recalled. Self-analysis is good, but it doesn't seem right to place too much faith in it. It is apt to be misleading unless fortified by good judgment, optimism and a willingness to give the rest of the world the benefit of the doubt, whenever your own weaknesses are involved. It is also well to remember that it is natural to overrate our own virtues and underrate those of our fellowmen.

It has always been my custom to try to put an applicant at ease, and to relieve him of any embarrassment, all interviews, with few exceptions, being held in my office. Having real sympathy with any man, young or old, out of work, it has never been very difficult for me to bring out the leading and most indicative points in their past life, and from their manner and expression gather enough material to form a preliminary opinion as to their suitableness for the position in mind; looking all the time for some evidence of small vices in either habits or dress that would aid me in forming an opinion. While I agree with Mr. Denniston that business history is important in many respects, at the same time we should remember that necessity often drives a man to uncongenial work, and that these various changes may be due to ambition rather than inefficiency, to an honest effort of a square peg to get away from a round hole; and that there is a right place for almost everybody, and that in many cases a little polishing up may make the square peg fit in the round hole.

This reminds me of a friend who a few years ago wanted a man about the house. A very neat-looking colored man applied for the job. He seemed to have been something of a rover and my friend said to him: "You have doubtless heard the old saying, 'A rolling stone gathers no moss.'" "Yes, sir, I know that; but a rolling stone gets a mighty high polish."

When in first reading over the paper, I came to that portion referring to the lack of gray matter in a large fat fellow, I was just a little bit upset, and when that was supplemented by the remarks on the blond man, I felt the perspiration starting. The only consolation in that portion of Mr. Denniston's paper lies in the first four words, "There is no rule;" consequently, there are exceptions and I hope I am one of them.

After receiving Mr. Denniston's paper, I was reading a new book by Katherine M. H. Blackford, M D., and Arthur Newcomb, on "The Job, The Man, The Boss," and came across a photograph of Mr. Taft, who was described as a "vital man." Thinking, as I read along, that I recognized some personal traits, I commenced reading the following portion to my wife, expecting, of course, that she would recognize the personal application; and I am sure you will appreciate and enjoy the point:

"When the digestive and nutritive systems is most highly developed and most used in proportion to the other organs and functions of the body, the whole person gives evidence of being well nourished. The individual of this type, therefore, has a head comparitively small in proportion to the body; cheeks full and well rounded, giving the face and head a circular or pear shape—with the big end down; chin full and often double; body modelled upon the circle, large around the waist and tapering to feet and shoulders; limbs round and short; hands and feet well covered with flesh; so that the bones and muscles do not show; health usually robust; movement slow and deliberate. The extreme of this type is corpulent. This is the vital type. The predominating characteristic of this type is enjoyment of the good things of life. He likes to eat and drink. He loves ease and comfort. Muscular activity is distasteful to him. He often dislikes prolonged, severe mental work. Since vital people do not like to work physically or mentally, and yet crave all of the best products of work, the only way they can gratify their desires is by directing the work of others. The men who have the natural ability to sit in comfortable chairs and direct the mental and physical activities of thousands of others, reaping for themselves great rewards, are usually of this well-nourished type. Since the vital type is interested in good things to eat, fine and comfortable things to wear, and the comforts and luxuries of life generally, he enjoys handling them and is able to interest other people in them. People of this type are therefore fitted to succeed as butchers, bakers, chefs, grocers, produce and commission merchants. Modifications of this type are well qualified for the dry goods and clothing business, and indeed for all retail and wholesale merchandising, large and small. Since the handling of money gives a very large degree of control over the activities of other men, and since also money is the medium of exchange for the good things of life, the finances of the world are controlled very largely by men of the rounded, well-nourished type. Morgan, Schiff, Stillman, Vanderlip, Ryan, Belmont, Hill, and many other financiers show considerable development of the vital element. The large man, as we have seen, is slow movement, with comparatively slow circulation and respiration. It may be for that reason that he is also calm, deliberate, unhurried, and not easily or readily excited. The well-nourished man, other things being equal, is comfortable and free from nervous irritability as well as from apprehension and worry as to his personal well-being. It may be for these reasons that men of this type so often have unprejudiced, judicial minds and are able to weigh all evidence carefully and impartially and reason to a just and logical conclusion. Well-rounded, full-bodied men are often well fitted to be judges, referees, justices, arbitrators, and in general, to exercise judicial functions."

CURRENT MENTION.—

THE Hot Springs properties of the Federal Light and Traction Company have recovered rapidly from the losses sustained in September, 1913, and are now back to an earning basis equal to that previous to the fire. Their properties are the Citizens Electric Company, the Consumers Gas Company, the Hot Springs Water Company and the Hot Springs Street Railway Company. The gas company and the water company did not suffer any material loss by the fire, except in decrease in water sales and higher cost of operation due to substitution of steam for electric power in pumping water reducing the net earnings of the water company about $10,000. The earnings are now back to normal and a good increase is expected for the current year.

WILLIAM FLOYD LEE, Chief Engineer of C. W. Hunt Co., Inc., West New Brighton, N. Y., at a recent meeting of the Board of Directors, was elected Vice-President and Chief Engineer of the Company.

THE complaint of the Village of Hempstead, N. Y., against the Nassau and Suffolk Lighting Company, asking for a reduction in gas rates, has been withdrawn. At the last hearing before Commissioner Decker at Albany, an agreement was reached for a readjustment of rates, to be put in effect early in 1915.

(*Continued from page* 391.)

Prompt maintenance service is vital in holding business after it is secured. We all know that gas burning appliances will not give continuous perfect service without attention. Since this is true, it is simply a question of how much attention is needed. One small appliance out of order can spoil more friendship in a day than a salesman can regain in a week. It is imperative, therefore, that a regular maintenance system be inaugurated and followed out very carefully. The point to be kept in mind is that when a man has difficulty with a gas appliance, he is more likely to become disgusted with gas as a fuel than to blame the appliance. All gas appliances should be kept in such good repair that there will never be any occasion for the cook to notify the proprietor that the gas stove is out of order. Another very important feature in holding business is the idea of continued attention after the appliance is installed. This may be done either by the salesman who placed the order originally, or by some man delegated to this part of the work. Kitchen help in a public eating house is a very uncertain quantity. You are never sure when a chef will take a notion to leave his position and take his entire crew with him, or when he and his crew may be asked to leave. If this kind of a change is affected without the knowledge of the gas company, so that the new men may be instructed in regard to the operation of the appliances, it is almost inevitable that the appliances will at once become unsatisfactory and the gas bills excessive.

Recommendations.—A situation that I believe has materially retarded the success of gas companies in this work is the fact that they have been compelled to recommend only standardized equipment. Standard equipment will appeal to different men in different ways, hence an appliance that will satisfy one man will not be acceptable to another. All regular hotel equipment concerns if unable to sell standard appliances, will build them according to the dictates of the customer. While I believe that in the matter of gas burners we ought to be positive and insist that the customer accepts our recommendations, I also feel that the design and construction of the appliance is a matter of small moment to us. If the customer is desirous of having appliances of distinctive type of design, I see no reason why he should not be accommodated. Of course, specially built appliances will cost more, but hotel people understand that, and they will not quibble over a few dollars if they can have their ideas carried out. I recommend that the manufacturers, who are building the equipment which gas companies sell, be advised of this situation and that arrangements be made with them to build special appliances whenever a customer requests.

Most of us become so absorbed in playing the game of securing new business, that we fail to make a proper record of results obtained on complete installations. When a salesman makes an investigation prior to installing gas equipment he is familiar with every detail of the situation. Unless this information is tabulated at the time and placed on file for future reference, it is liable to be forgotten. The salesman may think he will always remember it, but as other propositions arise, each with its distinctive features, the minute details which may have been deciding factors either for success or failure, are lost. If an order is not closed this information is valuable when an attempt is made to revive the prospect. If the order is closed, it is all the more valuable, especially when the results obtained by using gas are added. A compilation of such information is invaluable as selling data because anyone may readily refresh his memory on obstacles overcome and subsequent success with gas.

In order to be the best possible business producer in this line of work a man must be primarily a salesman and know the gas business. In addition he should be a chef, a baker and a mechanical engineer. The trouble with us, as a rule, is that we too frequently have nothing in common with our customers. We attempt to engage them in conversation on gas when we should be talking to them about their business and showing them how gas can be applied. In a hotel proposition, for example, we can hardly expect the kitchen help to study the gas business in order that they may learn how to use fuel gas; therefore, it is our duty to study the cooks' business so that we may talk to them in kitchen parlance about cooking with gas. We ought to be able to understand instantly when a chef says "I made my percentage last month," that his house received $2 for every dollar's worth of raw material. We should understand what constitutes the different kinds of service, such as Table d'Hote, A la Carte, Carte du Jour, Dejeuner, Dejeuner a la Fourchette, etc., and know how a change in appliances might affect their preparation. We ought to know that most hotels try to keep their fuel cost down to 1 per cent. of the income from the sale of food, and that when it reaches 1½ per cent. we are liable to receive a complaint on the gas bill. We ought to know that hotel men do not enjoy discussing their business with a man who knows nothing about it. Hotel men are keen business men and we must learn their language, so to speak, in order to inspire confidence and be understood. We are too content to be just gas men. Let us study our customer's business until we understand it as well as we do our own, then we will be able to apply fuel gas intelligently.

Conclusion.—A natural law teaches us that matter moves in the line of least resistance, and there seems to be a tendency on the part of many human beings to be the same thing. One who is able, in his imagination, to step aside and look at himself and his field of action from the standpoint of an outsider, is the only one able to grasp every detail of a situation. We are prone to fix our eyes on one object and forget that there are others that should receive our attention. In the hotel and restaurant field we have all been quite successful in selling cooking equipment, but we cannot feel proud of our accomplishment in baking, water heating, space heating or specialties.

During the last 3 years in Chicago our sales of hotel and restaurant appliances have been approximately as follows:

Cooking	1,800	appliances.
Baking	200	"
Water Heating	300	"
Space Heating	350	"
Specialties and Miscellaneous.	400	"
Total	3,050	"

From this you see that while our business in the cooking field has been good, it is evident that much energy must be expended in the other fields before we can claim success.

These 1,800 cooking appliances are ½ hotel ranges, ¼ domestic ranges, and ¼ broilers, steam tables, urns, etc., and represent an average of 600 per year. The 1,250 appliances in the other 4 divisions represent an average of only 100 a year in each division. In placing the 600 sections of hotel ranges, we displaced 64 ranges where coal was used for fuel. These ranges contained 128 ovens and 91 fires, and had a total length of 442 feet. In making this displacement about 300 sections of gas range were used, the other 300 sections being in replacing other gas equipment and on new jobs. In the 600 sundry appliances are 100 hotel broilers and 50 broiler burner equipments. The actual displacements of charcoal broilers were only 10, but since the 50 broiler burner equipments were used in converting charcoal broilers to gas, the result is the same as though we had sold 150 broilers and displaced 60 charcoal broilers.

The cost of cooking with 80 cent gas compared with hard coal at $8 per ton is difficult to obtain. While a laboratory test shows that 80-cent gas costs about four times more than $8 hard coal, it does not hold true in actual practice. The comparative cost seems to vary with each installation. We have some instances where the owners claim 80-cent gas is double the cost of $8 coal, and in the majority of the installations the proprietors admit that gas does not exceed the cost of coal more than 20 per cent. to 30 per cent., while in many cases they voluntarily assert that 80-cent gas is as cheap as $8 coal. It is evident, therefore, that the cost of cooking with gas as compared to coal depends upon how economically the gas is used, and how far the user is willing to consider the overhead charges occasioned by the use of coal.

We have made some progress in baking, as evidenced by the sale of 200 bakers' appliances; but the criticism is that these appliances, especially ovens, have not been placed in bakeries. Our customers have been hotels, restaurants, delicatessen stores and private home bakeries. It is a deplorable fact that probably 98 per cent. of the 1,500 bakeries in Chicago fire their ovens with solid fuel. I am probably not far from the truth when I assert that you have the same condition in your towns. I submit that the reason for this is because there is not a satisfactory gas fired baker's oven on the market.

The charge is made by bakery equipment concerns that the gas companies do not interfere at all with the sale of their ovens. They say that we only locate prospects for them. We sell our gas ovens and start a man in business. They follow by removing our ovens and installing coal ovens. I have been unable to determine just how true this statement is, but if it is the case, we certainly should bend every energy, and spare no expense in developing an oven that will satisfactorily handle bakery business. We should not allow a condition of this kind to exist. Let us make a promise that before this

body meets again we can say to the Master Bakers' Association, "Your people are no longer compelled to use solid fuel." I venture the assertion that no one uses coal from choice, and if some one will produce a satisfactory oven, millions of feet of gas can be sold annually for this work, not only in Chicago, but in smaller towns as well. We have made some investigation and done considerable experimenting with the Reel oven. We hoped that it would be an entering wedge to this vast field, but it is evident that we are no nearer the solution of the problem now than before. We installed an oven of this type in a pound cake bakery, but it was immediately appropriated for the baking of cookies. The oven is absolutely satisfactory for this work, but the proprietor would not think of displacing his coke ovens with this type of gas oven for baking pound cake. The same type of oven was installed in a small bakery, whose daily output was about $30 worth of a general line of bakers' goods. The oven is perfectly satisfactory here, but we are not sure that it would be if the shop were any larger. Our experience leads us to believe that there is a field for this oven in hotels, restaurants and very small bakeries. but not in large bakeries.

We have equipped many brick ovens in hotels and clubs for gas by placing burners in the coal fire box, and there seems to be no difficulty in securing satisfactory results if the installation can be supplied with our fuel gas at 40 cents per 1,000. This kind of an installation, however, is prohibitive on 80 cent gas. We have two installations firing brick ovens with 80-cent gas, and though we are holding the business, we appreciate that it is not because of fuel economy. We cannot even approach the cost of coal. One oven is using a million feet of gas per month and the other ½ million. In both instances the fuel cost is three times that of coal. The fuel cost in a well regulated bakery using $8 hard coal is approximately 1 per cent. of the retail price of the finished product. The nearest we have been able to approach this cost on 80-cent gas is on the Reel oven baking cookies, the fuel cost being 1½ per cent. of the retail price of the product. On the Reel oven in the small bakery using 80-cent gas the fuel cost is 2 per cent. It is obvious, therefore, that some other plan must be adopted or new ovens constructed before we can hope to win in this field.

Water heating is practically an untouched field. Far too great a percentage of the places under the jurisdiction of the hotel and restaurant divisions are heating water with coal. This is due partly to the inefficiency of large size gas water heaters, and partly to a lack of appreciation on the part of gas companies of the importance of the subject. The conditions in the field of baking with respect to the appliances themselves do not obtain in the water heating field. The automatic instantaneous water heaters and automatic storage systems with moment valves, have no difficulty in performing their work satisfactory, provided sufficient care is exercised in selecting the size and type. The trouble is that since in actual practice they are only 58 per cent. to 60 per cent. efficient, they produce excessive fuel costs. Our ability to secure business on these heaters, therefore, depends upon how successful we are in persuading our customers that the service rendered is worth the price charged. This being so, the situation is reduced to a matter of salesmanship. The chief reason that gas water heating is not further advanced in public eating houses is lack of attention. We have been content to allow a customer to use his judgment in regard to the size and type of heaters, and he selects the one that costs the least. For this reason many heaters have been removed as unsatisfactory, when it was not the fault of the heater. No order for a large water heater should be accepted without first making a thorough investigation of the conditions under which the heater is to work. It is better to lose an order than to have a heater removed as unsatisfactory.

The comparative cost of coal and gas for heating water is also very difficult to obtain. No one knows how much water they use. The coal is usually taken from the common supply for the building, therefore, the quantity used is uncertain. Judging from the best information we have been able to secure 80c. gas is equal to or less than hard coal at $8 per ton in cases where the demands for hot water are 500 gallons per day or less. Where the demand is 1,000 gallons per day or more, 80c. gas is about double the cost of $8 coal; showing that while we are able to secure a great deal of business on the present equipment, we really need a larger water heater of greater efficiency before we can successfully handle all of the large problems.

Space heating has undoubtly been neglected. We have been spending our time on the large propositions, feeling that the space heaters would sell themselves. Possibly this is true with the small type of heater; but this heater comes far short of handling the space heating problem. There is a vast field for business here, which we have complacently awarded to the coal man. Space heating or house heating, in its broadest sense, deserves our careful consideration. The generally accepted notion of this field is in casher's cages, small rooms or corners, as auxiliary heat in cold weather; or for temporary heat in late Spring or early Fall. But why stop here? Why not install a complete heating system? Of course the first rebuff you will meet is that the fuel cost is prohibitive. I am not convinced, however, that this is a legitimate objection. We have been compelled to sell service with hotel ranges to offset excessive fuel cost, so let us use the same arguments in selling house heating. If we had suspended activities for hotel cooking because we could not meet the cost of coal, we would be decidedly behind the times now, because it is only recently that more efficient ranges have enabled us to approach the cost of coal for this work. We have made some progress in space heating with the individual radiator unit, known as the gas-steam radiator. But compared to the size of the field in this kind of business, we have only just begun. We have many complete installations, some running as high as $350. Our success leads me to believe that we could succeed with a central heating unit of the gas-steam boiler type for steam heat, or the gas water boiler for hot water systems. Many people are willing to pay excessive fuel cost in consideration of receiving perfect service. Since perfect service can be rendered by gas, I believe it is our duty to provide ourselve with the proper appliances for this purpose. The cost of heating on 80c. gas is estimated at from 35 per cent. to 100 per cent. more than $8 hard coal. Judging from information at hand, the individual radiator unit type does not exceed 50 per cent. more, and the central unit type is about double. So long as the operating expenses does not exceed twice the cost of coal, we need have no hesitancy in submitting the proposition to the public.

Specials.—Since, according to our plan, we handle all requests for fuel in the places named, any proposition that does not come under any of the four preceeding subjects is classed under specials. The most interesting subject under this head at present is that of gas refrigeration. Your are all probably familiar with the Zicer machine. We have recently applied it to hotel work in a special chef's cabinet in the kitchen of the Bismark Hotel. The cabinet is beside the broilers and used to keep the broiler chef supplied with steaks, chops, fish, etc. The cabinet is 5 feet wide, 4 feet deep and 6 feet high; and the temperature is kept between 35° and 45°, with a consumption of 400 cubic feet of gas per 24 hours. The cost of operation on 80c. gas is less than ⅓ that of ice at $3.50 per ton. The machine is wonderfully successful in this size, and pleases the hotel people exceedingly. There seems to be practically no limit to the field for gas refrigeration. Everyone to whom the subject is presented and explained at once becomes interested. It is applicable to all kinds of refrigeration, because it can be operated on 80c. gas cheaper than an electrically driven compression system. It is applicable to all ice box propositions because it supplies refrigeration as low as desired, while ice can never produce colder than 32° and that only for a short time after the ice supply has been replenished. An investigation of refrigeration and ice box conditions impresses one with the fact that ice is very undesirable for this purpose. At best it is only a very poor substitute for refrigeration and very unsatisfactory. The disadvantages of using ice for keeping food cold are almost numerous as those attendant upon the use of coal for fuel.

In review, may I say, analyze the field, and make a survey of the task to be performed. Classify the business according to the natural divisions so that you may mark successes and locate failures. Advertise by some attractive method when you have an interesting story to tell. Maintain as friendly relationship with competitors as possible. Solicit incessantly, using such aids as morning meetings, photographs, etc., where practical. Make trial installations freely. Provide quick and comfortable transportation to save the time of your customers and salesmen. Make personal friends of everyone as far as possible. Keep your promises to the public. Teach your customers how to read their meters and advise them to buy gas by the day instead of the month. Make provisions for maintenance service and do not forget that when you sell an appliance you are just beginning to do business with your customer instead of finishing. Secure special appliances if standard do not suit. Assist your memory by tabulating all detailed information for futare reference. Remember that you are salesmen and gas men. Study your customer's business in detail as well as your own. Give the best there is in you and you will succeed for your company and for yourself.

Study of the Composition of Water Gas Tar.[1]

By C. R. Downes and A. L. Dean.

Water gas tar, more properly carburetted water gas tar, is the tarry product separating out in the systems of plants manufacturing carburetted water gas. It is much less viscous than ordinary coal tar, with a distinctly different odor, due in part to the absence of the phenols and bases characteristic of coal tar. It is understood that a portion of the petroleum used in carburetting, after passing through various molecular changes, appears finally as tar, but of the exact nature of the transformation little is definitely known. It is, of course, the object of the gas maker to change as large a percentage of his oil into permanent gases as possible, and keep the production of tar to the lowest limit.

A search through the literature for data concerning water gas tar yields but fragmentary and inadequate results. A. H. Elliott, Matthews and Goulden, and C. N. Forrest, have recorded the results of fractional distillations of the tar, and Dean and Bateman, S. P. Sadtler, and Forrest have furnished information regarding the composition of creosote oils derived from water gas tar. Some of the statements found in the literature refer to material clearly quite different from the water gas tar produced in the standard American installations of the present day. Thus Matthews and Goulden's tar was lighter than water and contained 8.51 per cent. of "light paraffins."

1. "Journal of Industrial and Engineering Chemistry."

The data presented in this paper were obtained on water gas tar from the purifying systems served by several standard Lowe system water gas sets. The carburetting oil in use at the time was derived from Oklahoma crudes. As might be predicted, the tar separating at different points along the purifying system, as the gas passes from the sets to the final stages of purification, becomes progressively lighter and richer in the more volatile constituents. Mixed tar from the whole system was used for the work described.

A series of detailed fractional distillations was carried out with a view to locating the boiling points of any individual compounds which might be present in substantial amounts. The first distillation of the tar up to 250° C. was carried out in a 5 gallon copper still, the distillation being affected by immersing a resistance coil in the tar. The distillation thus obtained constituted the "First Series" of fractions and the residue was saved for later study. These first fractions were then refractioned from an electrically heated glass flask provided with a Hempel column, yielding the "Second Series." In refractioning the second and subsequent distillates a modified Young dephlegmator was employed up to 200° C., and above that the Hempel column. This Young dephlegmator consisted of 6 chambers, the floors of perforated glass plates, provided with overflow tubes as indicated in Fig 1. To avoid excessive condensation in the chambers the dephlegmator was air-jacketed up to 110° C., and above that enclosed in an asbestos sheath heated by resistance wires. In this way the process of repeated fractionation, according to the common practice of handling the fractions in such work, was continued to the "Third Series" of fractions, boiling up to 250° C., and to the "Sixth Series" with the lower boiling portions. The curves of the third and sixth series are shown in Figs. 2 and 3.

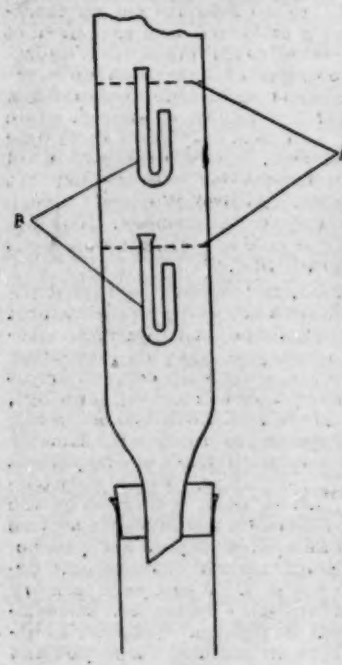

Fig 1.—Chambers of Dephlegmator.
A, Perforated Glass Plates,
B, Siphon Tubes.

From Fig. 2 it is clear that the largest single constituent boils at about 220° C., approximately the boiling point of naphthalene. The abrupt rises in Fig. 3 at 80°, 110° and 140° C., indicate the presence of appreciable amounts of individual substances boiling near these temperatures, which were subsequently proven to be benzene, toluene and the xylenes. A smaller irregularity appears near the boiling point of mesitylene, 164.5° C. It is believed that a fairly satisfactory separation had been achieved in this sixth series, and during considerable portions of the distillations, when the distillates appeared to be nearly pure compounds, fractions were taken at each degree rise in temperature and corrections made for the emergent thermometer stem.

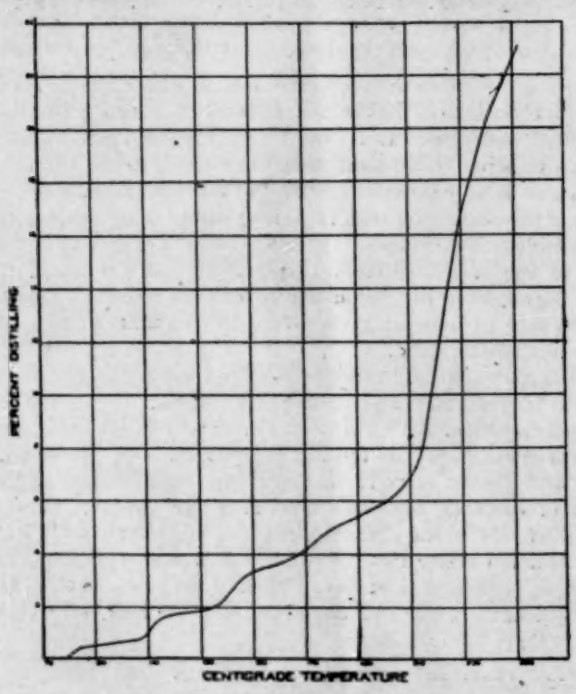

Fig. 2.—Third Series Distillation.

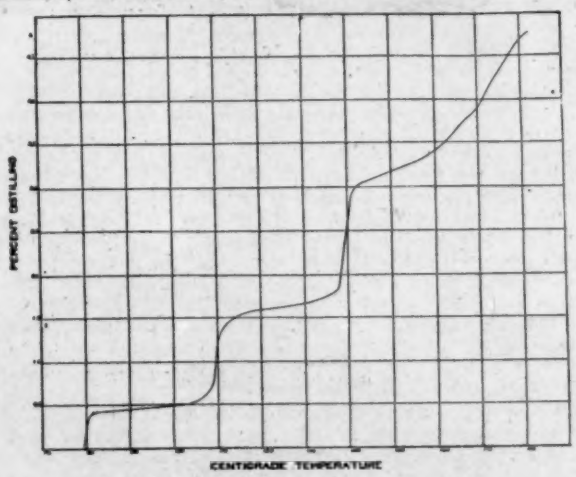

Fig. 3.—Sixth Series Distillation.

Indices of Refraction.—The indices of refraction of the fractions of the fifth series were determined at 30° C., with the results shown in the following table:

Temp. of Fraction. ° C.	Refractive Index at 30° C.	Temp. of Fraction ° C.	Refractive Index at 30° C.
79— 83	1.4938	125—130	1.4916
83— 85	1.4938	130—137	1.4935
85— 90	1.4933	137—145	1.4967
90— 95	1,4923	145—150	1.4987
95—100	1.4921	150—155	1.4976
100—109	1.4910	155—160	1.4968
109—113	1.4909	160—165	1.4979
113—115	1.4910	165—172	1.5030
115—120	1.4908	172—179	1.5180
120—125	1.4912	179—185	1.5269

The bromide absorptions of the fractions were used as a relative measure of the unsaturated hydrocarbons. The determinations were made by allowing an excess of a tenth normal solution of bromine in carbon tetrachloride to react on 1 cc. of a sample for 15 minutes, the vessel containing the mixture being immersed in a bath of ice and salt and kept in the dark. After this reaction period the unused bromine and the hydrobromic acid formed were both determined, and from these determinations the grams of promine added per cubic centimetre of oil could readily be calculated.

Sixth Series Fractions. ° C.	G. Br. Added. Per cc.	Third Series Fractions. ° C.	G. Br. Added. Per cc.
78.9— 79.7	0.0133	180—205	0.4487
79.7— 80.7	0.0181	205—235	0.2526
80.7— 85.0	0.0133	235—250	0.1629
85.0— 92.0	0.0182	Second Series Fractions.	
92 —101	0.0192		
101 —109	0.0141	250—260	0.0479
109 —110.5	0.0104	260—270	0.0432
110.5—114	0.0133	270—280	0.0610
114 —120	0.0247	280—290	0.0442
120 —130	0.0364	290—300	0.0963
130 —138	0.0671	300—310	0.0771
138 —142.5	0.1098	310—320	0.0700
142.5—145	0.1724		
145 —150	0.2186		
150 —155	0.1832		
125 —160	0.1616		
160 —164	0.1522		
164 —167	0.4176		
167 —172	0.4824		
172 —177	0.4008		
177 —182	0.5520		

Since the hydrocarbons of water gas tar have their origin in petroleum, it might be supposed that considerable quantities of "paraffins" would be found in the distillate therefrom. To throw light on this point the fractions were sulphurnated with concentrated sulphuric acid and the percentage by volume of the unsulphurnated residues determined.

The extraordinary high percentage in the distillate from 180°—205° calls for some comment. The residues from all the other fractions were washed to clear oils, but the material obtained here was of putty-like consistency and resinous odor, and appeared to be a polymerization product of some unsaturated hydrocarbon rather than a "paraffin."

Low-Boiling Fraction.—On repeated distillation of the first fractions below 75° C. a small amount of a very volatile liquid was obtained, boiling between 44° C. and 65° C., most of it coming over between 60° and 63°. So small a quantity of this material was obtained that anything more than a few qualitative tests was not

feasible. It charred and left no residue of undissolved oil when treated with sulphuric acid. It reacted violently with strong nitric acid, and absorbed bromine rapidly from bromine water, forming a brominated product heavier than water. No test for sulphur could be obtained. These tests combine to indicate a hydrocarbon mixture of markedly unsaturated character.

Temp. of Fraction 6th Series.	Per Cent. Unsulphurnated.	Temp. of Fraction 6th Series.	Per Cent. Unsulphurnated.
75 — 79	0.06	138 —142.5	1.2
79 — 80	None	142.5—145	2.4
80 — 81	None	145 —150	1.2
81 — 85	None	150 —155	2.2
85 — 92	None	155 —161	1.6
92 —101	None	161 —166.5	1.8
101 —109	None	166.5—172	1.6
109 —110.5	None	172 —177	None
110.5—114	None	3rd Series.	
114 —120	None	180 —205	55.0
120 —130	0.4	205 —235	1.4
130 —138	0.4	235 —250	2.2

Thiophen.—The sulphur containing compound thiophen (C_4H_4S) appears to be always associated with benzol in coal tar light oil. Because of the closeness of its boiling point (84° C.) to that of benzol, it cannot be removed by fractional distillation. The presence of thiophen in water gas tar distillates was indicated by the indophenine test with isatin and concentrated sulphuric acid. The method of Deniges was followed in making quantitive estimation of this compound. The average of 13 analysis of the fractions between 79° C. and 90° C. was 2.1 per cent.

Tests for the higher homologues of thiophen were obtained with the higher boiling fractions, but no quantative estimations were attempted.

Benzene.—An inspection of the distillation curve of the sixth series shows a decided rise at the boiling point of benzene, indicating the presence of about 0.4 per cent. of that compound. The distillate between 79° and 81° could be readily nitrated, giving a good yield of nitro-benzol boiling between 106 5° and 107.5°, and showing no evidence of "paraffins" by the method given by Lunge. Dinitrobenzene, melting point 90°, and aniline distilling between 182° and 185° were also prepared from the purified benzene obtained from water gas tar. The aniline was colorless and turned only slightly brown on standing 4 months protected from sunlight.

A number of samples were prepared conforming to the requirements of the commercial grades of benzol. The starting material was a crude light oil obtained in the initial distillation of water gas tar in a large still. This was fractioned up to 180° C. from a large plain distilling bulb and the distillate refractioned through a Hempel column taking the following fractions:

1..68°– 79° 2..79°–100° 3..100°–125° 4..125°–155°

Pure benzene was prepared from the fraction No. 2 by agitating with concentrated sulphuric acid, followed by washing with dilute acid and water, and agitation with caustic soda solution followed by thorough washing. Under laboratory conditions a loss of 4 per cent. was experienced by these treatments. The washed product was carefully redistilled with Hempel column and Young dephlegmator, yielding a product of correct boiling point. This c.p. benzene gave no test for thiophen, no discoloration with concentrated sulphuric acid, was of sweet odor and has shown no yellowing on standing for two years.

Preparations of 90 per cent. benzol and 50 per cent. benzol were also made from water gas tar light oil by fractional distillational and washing with sulphuric acid and caustic soda. With these products much less exact fractional distillation was required than with the c. p. benzol. Both preparations were free from thiophen, gave no color with concentrated sulphuric acid, and have remained water white and sweet for 2 years. The loss in washing was small.

In preparing 160° benzol or solvent naphtha the same general process of washing was followed, but the loss in washing was much greater, amounting to over 15 per cent. The product was of good color and odor, and gave a very pale straw color with concentrated sulphuric acid.

Toluene.—An inspection of the "Sixth Series" distillation curve shows a rise of about 0.8 per cent. at the boiling point of toluene. A portion of this fraction of the sixth series was nitrated, giving 85 per cent. of the theoretical yield, and showing but a trace of paraffins.

The fraction No. 3 from the Hempel column distillation mentioned under "Benzene" above, was washed with sulphuric acid and alkali (with a loss of 6 per cent.) and the washed oil fractioned with a Hempel column. The fraction 95°–120° was redistilled with the same apparatus, and the fraction 109.5°–111.5° taken. This product compared favorably with standard makes of c.p. toluene, and gave no test for thiotoluene and no color with concentrated sulphuric acid.

Xylenes.—The next decided rise in the distillation curve after that at the toluene fraction appears around 140°, suggesting the presence of xylenes. The curve indicated about 1.2 per cent. of these hydrocarbons. The separation of the three isomeric xylenes by fractional distillation is not feasible because of the nearness of their boiling points. By the use of Levenstein's method one sample of xylene fraction yielded 75 per cent. metaxylene, 20 per cent. para, and, by difference, 5 per cent. of the ortho. On another sample of water gas tar, the results were 77 per cent. meta, 19.5 per cent., para, 2.0 per cent. ortho, and 1.5 per cent. "paraffins." It is doubtful whether the ortho-xylene is present in more traces since a qualitative test failed to reveal its presence. The sodium salts of the ortho and meta-xylene sulphuric acids were prepared according to Jacobson. The needle-like crystals similar to those described for the ortho salt were only present in very small amounts. Metaxylene boiling 138°–139° was prepared according to Jacobson by decomposing the meta-xylene sulphuric acid.

Mesitylene.—A slight irregularity of the distillation curve around 165° suggested the presence of mesitylene. The "Sixth Series" distillate obtained at this point was twice redistilled with a Glinsky dephlegmator and the distillate between 164° and 167° nitrated. A solid nitro-compound was obtained, which after careful washing and recrystallization gave a constant melting point of 236°. The nitration of another portion gave a product melting at 235°. From the alcohol used to wash the crystals of trinitro mesitylene a small crop of barrel-shaped crystals was obtained which on repeated recrystallization gave a melting point of 167°, and contained 16.31 per cent. of nitrogen. The theoretical nitrogen content of trinitro-trimethyl benzenes is 16.47 per cent., but the melting point is far too low for trinitro pseudocumene. The amount of this compound was too small for further experiments, and it remained unidentified.

Naphthalene.—Inspection of the distillation curve for the third series shows that the most decided rise in the whole curve appears between 215° and 235°, indicating a relatively large proportion of naphthalene. An attempt was made to estimate the amount of naphthalene as follows: 500 grams of tar were distilled to 260° C. and the naphthalene separating in the distillate filtered off and pressed in a screw press; the filtrate was placed in a freezing mixture and the new crop of naphthalene crystals similarly removed: this filtrate was distilled collecting a fraction from 185°–265°, which was cooled, filtered and the naphthalene pressed; the new filtrate was refractioned, taking a fraction 195°–235°, which was similarly deprived of its naphthalene and the new filtrate distilled, collecting a fraction 210°–225°, which yielded but a very small separation of naphthalene when placed in a freezing mixture; the total weight of the solids thus recovered amounted to 8.0 per cent. of the tar. Naphthalene was prepared from the solids pressed from the distillate obtained from water gas tar between 200° and 250°. These solids were distilled, rejecting the first and last 10 per cent, and the distillate treated with sulphuric acid containing a little dichromate. The product, after thorough washing with water, was pressed and distilled, giving a product boiling at 217° C. (uncorrected) and melting at 80°, which showed no discoloration with concentrated acid and remained perfectly white after an exposure of 4 months to the light.

Anthracene.—The above described experimental work was carried out for the most part on that part of the water gas tar which distilled below 250° C. in the initial distillation. The residue above 250° C. was worked up in collaboration with Dr. F. L. Haigh. Two methods of distilling this residue were tried; in one the distillation was carried out with heat alone, in the other, steam was introduced into the still in considerable volume. In both types of distillation most of the fractions showed a separation of solid materials on cooling. These solids were removed, pressed and weighed and the anthracene in them determined by converting the anthracene into anthraquinone by treatment with chromic acid in glacial acetic acid solution. The anthraquinone was further purified by solution in fuming sulphuric acid and recovery therefrom by dilution.

The results of the dry distillation were as follows:

Temperature Degs. C.	Per Cent. of Solids in Fractions.	Per Cent. Anthracene in Solids.	Temperature Degs. C.	Per Cent. of Solids in Fractions.	Per Cent. Anthracene in Solids.
265	...None	....	335–345	4.19	41.75
265–305	....None	....	345–355	4.27	34.85
305–315	.... 1.32	65.49	355–360	3.39	26.41
315–325	.. 2.32	61.35	360–370	4.36	7.41
325–335	.... 3.85	42.82	370–400	None	....

These results show the presence of 0.392 per cent. of anthracene in the residue above 250°, equivalent to 0.29 per cent. of the original tar.

The thermometer readings in the steam distillation were of little value; the fractions were accordingly cut at about each 250 cc. of oil distillate in distillations of 5,000 grams of the "Residue." The solids were determined and analyzed with the results given below:

Fractions.	Volume Cc.	Wt. of Solids in Fractions.	Per Cent. of Anthracene in Solids.
1	250	None	....
2	260	None	....
3	250	None	....
4	260	1.1	58.20
5	250	5.8	47.26
6	260	11.0	46.83
7	250	15.2	40.52
8	250	14.4	43.76
9	250	12.1	39.19
10	250	5.4	21.73
11	260	None	....
12	250	None	....

In the steam distillation, therefore, 0.517 per cent. of anthracene was recovered from the "Residue" above 250°, equivalent to 0.383

per cent. of the original tar. There was clearly less decomposition when steam was used, since the pitch contained but 5.6 per cent. of free carbon, whereas that from the dry distillation averaged 57 per cent. Practically all of the anthracene comes over under 360° in the distillation, and at that temperature little cracking has taken place, the pitch containing but 6 0 per cent. free carbon. Above 360° an orange-colored, viscous, semi-solid material appears in the distillate and seems to be indicative of marked decomposition.

Fairly pure anthracene was prepared from the expressed solids by washing with gasoline, and subliming the residue. This anthracene melted at 207°-211° C., and when mixed with a sample of Kahlbaum's anthracene, the mixture melted at 208°-211°.

As a further test of the quality of the solids pressed from the high boiling distillates, 50 grams of these solids recovered from the distillate between 289° and 361° were oxidized with bichromate and sulphuric acid. The anthraquinone after purification was sublimed giving 18 2 grams of crystalline anthraquinone. Anthraquinone prepared in this way was converted into the sodium anthraquinone-monosulfonate which in turn was converted into alizarine. A beautiful orange-red crystalline preparation of alizarine was obtained on subliming the product. Under laboratory conditions the transformation of anthraquinone into alizarine is difficult, and the yields obtained correspondingly low. From about 20 grams of anthraquinone only about 7 grams of alizarine were obtained.

Summary.—A systematic fractional distillation of water gas tar shows that it possesses a general resemblance to coal tar in its hydrocarbon content, although, of course, the bases, phenols, and free carbon of the latter are absent or nearly so. The small amounts of material in the distillates resisting the action of sulphuric acid indicate an absence of paraffine and naphthalene hydrocarbons, and the marked variation in the capacity for halogen addition points to variable amounts of unsaturated linkings outside the benzene ring. Benzene, toluene, the xylenes, mesitylene, naphthalene, and anthracene were shown to be present in substantial amounts. The preparation of the pure hydrocarbons and of commercial products could be effected by methods similar to those employed with coal tar, and without encountering special difficulties.

It would appear probable that water gas tar may offer a commercial source of supply for the various grades of benzol and solvent naphtha. Naphthalene could readily be produced, but there is no adequate demand, and it is likely that the present trade conditions would not warrant the production of anthracene.

New Methods and Appliances.

Open Air Storage and Storage Under Cover.—The Carlsruhe Gas Research Station has issued a report on some coal set aside for an investigation of the difference it makes whether coal is stored in the open or under cover. In February, 1910, the Düsseldorf gas works stored 150 tons of Königsgrube coal in the open air piled 11 feet 8 inches deep; and another 150 tons in a shed to a depth of 10 feet. In 1913, after 3½ years' storage, 10 tons of each were sent to Carlsruhe, and carbonized under exactly similar experimental conditions. The most important of the data obtained, follow:

	Coal Stored in Shed.	Coal Stored in the Open Air.
Composition of the Coal:		
Ash	10.61	11.11
Moisture, gross	0.21	5.46
Carbon	86.92	82.09
Carbonization data:		
Temperature of carbonization, ° C.	1,185	1,180
Yield of gas (at 15° C. and 760 mm.)	11,972	11,972
" coke, per cent	71.9	71.1
" tar, "	3.8	4.4
" liquor "	6.9	8.4
Gross heating value of gas, B.T.U.	592.7	589.9
Ammonia per ton, pounds	6.074	5.916
Coke data:		
Went through sieve, per cent	19.0	32.2
The remainder, after a fall of 140 inches, gave—		
Lumps above 1.8 inch, per cent.	48.0	34.5
Nuts, 1.2 to 1.8 inch, per cent	25.7	22.9
Beans and peas, 0.2 to 1.2 inch, per cent	19.3	31.3
Dust, per cent	7.0	11.3

It is interesting to note that in this case the yield of gas and its heating value presented no marked difference, but that the coke from the coal stored in the open was decidedly inferior to that from the coal stored under cover. In other respects, the results were substantially the same, except that there was more liquor from the exposed coal. The Research Station has begun an investigation into the differences between fresh coal and stored coal.

Items of Interest
FROM VARIOUS LOCALITIES.

The balloon race for the United States championship, which will be held from St. Louis, Mo., July 11, will be the largest aeronautic event in the history of ballooning. A special coal gas will be made and mains laid to deliver it. It is estimated 900,000 cubic feet of gas will be required, and that it must be furnished at the rate of 150,000 cubic feet an hour. 1,200 feet of 12 inch main will be laid, and by these special arrangements the Laclede Gas Light Company, if pushed to the limit, can supply 300,000 cubic feet an hour.

Boston's 10,000 street gas lights are being lighted under the new 100-year contract with the Boston Consolidated Gas Company. The contract dates back to April 1, the city receiving the advantage of the new price from that date. The contract is at a price of $21, which is at a less price to the city of $3 per lamp per year.

At the annual meeting of the Board of Directors of the Municipal Gas Company, Albany, N. Y., William G. Furlong was elected Treasurer to succeed E. Palmer Gavit. Mr. Furlong has been Secretary of the Company, and will hold both offes. The other officers of the Company are as follows: President, Nicholas F. Brady; Chairman of the Board, Robert C. Pruyn; Vice-President and General Manager, Carl H. Graf.

The Brockton, (Mass.) Gas Light Company Employees Association Monday night elected officers as follows: President, John J. Sheehan; Vice-President, Leon M. Curtis; Treasurer, William P. Morton; Secretary, Hector Mongeau; Executive Committee, Joseph String, E. P. Mooney and Charley A. Bush. Plans were discussed for the annual outing in July. The following were named to make arrangements: John J. Sheehan, William A. Callahan, Hector Mongeau and William P. Morton. After the business session Joseph String, the new superintendent, spoke briefly.

Mr. Nathaniel W. Gifford, General Superintendent of the East Boston Gas Company, met with a pleasant surprise on entering the local office Wednesday afternoon. He was invited down to the work room, where he was met by the employees of the jobbing department and presented with a handsome modern collapsable dress suit case. The presentation was made by Charles A. Curil and was a decided surprise to Mr. Gifford, who leaves for Europe on the 20th. He managed, however, to express his thanks for the gift and promised to make it a remembrance of the friends he had left at home.

The Platolete Company, of New York, has been chartered in Delaware to make, sell and deal in self-lighting gas mantles. Capital is $500,000, and incorporators, J. F. Curtin and H. O. Coughlan.

The Hampton (Mass.) Gas Company, of which Daniel Cashman is Treasurer, are laying a 3-inch high pressure line over the famous 1-mile bridge at Hampton, for the purpose of supplying gas to the residents of Hampton Beach. The Amesbury and Salisbury (Mass.) Gas Company, now supplying gas at Salisbury Beach, will make pipe connections at the dead line, near the State line.

The Saugerties Gas Light Company, of Saugerties, N. Y., have contracted with the Davis & Farnum Manufacturing Company, of Waltham, Mass., for the erection of a gas holder up to retaining 50,000 cubic feet, resting in a steel tank, together with bench iron work, and sundry other supplies.

Mr. Charles H. Nettleton, President of the Derby (Mass.) Gas Company, who, with his daughter, Miss Katherine Nettleton, and Miss Susan A. Norcross, have been in France, Spain and Germany for the past 10 weeks, have returned home. Mr. Nettleton could not, of course, go anywhere without observing, and has not failled to see the latest in German colonization methods.

The Gas Machinery Company, of Cleveland, O., is under contract with the American Light and Traction Company, of New York city, to build an 11-foot water gas apparatus at the plant of the San Antonia Gas and Electric Company, San Antonia, Tex. They are also

to fill for the Cambridge (Mass.) Gas Light Company one bench of through 8's with high grade silica retorts and settings.

THE Ypsilanti, Mich., Council has voted to purchase the plant of the Ypsilanti Gas Company for $110,000, provided the proposition is ratified by the people at a special election, to be held July 25th. In case the deal is ratified the city will take charge about November 1st. Gas has been a sore topic with citizens of Ypsilanti for 3 years. The Company's franchise expired last January and the city has refused to renew it. The proposal to build a municipal gas plant was defeated in April by 60 votes, and was to have been voted on again June 15th. The latter election has now been called off. The agreement of council to purchase the old plant was largely influenced by the mediation of a citizens's committee headed by President Charles McKenny of the Normal College, former Mayor George Gaudey and Fred Nissly.

AN electrolysis survey of the City of Providence, R. I., to determine the damage being done to water and gas mains and other underground systems by this agency, will be started within a few days by the Rhode Island Company, City Engineer Clapp and Public Service Engineer Brunet. The survey will cover practically every street in the city, and will include an examination of the water and gas mains, telephone and electric conduits, electric car tracks and other systems which are affected by electrolysis.

"MOHAWK Coke" is to be the trade name under which the Mohawk Gas Company, of Schenectady, N. Y., is to market the by-product of the new gas plant in Villa road. The coke handling plant will be in operation in about six weeks, and the Company will have about 18,000 tons of coke per year to dispose of.

THE City Commission of Chattanooga, Tenn., construes the franchise of the Chattanooga Gas Company as requiring that Company to put service pipes from the property line into the house, where the house connections are made, provided the distance is not more than 60 feet. It is alleged that the Company has been laying these pipes free only as far as the building line, and charging for any extensions made into the house. Commissioner Betterton proposes citizens be notified to hereafter require the gas company to lay the pipes all the way to the point where the house connectiens are made, even if the pipes have to go beyond the building line and under the house, and to demand refund of all money collected for such extensions made in the past.

THE Security Investment Company of San Francisco has filed suit against the Pacific Gas and Electric Company to recover a total of $139,934, and asking also for an injunction to restrain the defendants from enlarging and improving their generating plant in Sacramento street near Montgomery street. The plaintiffs own an office building next door to the defendants' generating plant, and, claiming that the latter is a nuisance, ask monetary damages for almost everything that could be included under the word nuisance.

Two and one-half to three miles of new gas mains in Lincoln, Ills., during the summer of 1914, was the goal set at the annual directors meeting of the Logan County Gas Company, held Tuesday in the offices of the Company. The work will positively be done this summer, declared Manager Morgan, provided enough men can be procured to complete it in that time.

WILLIAM WHALEN, of 163 Riverdale avenue, Yonkers, N. Y., has brought suit against the Westchester Lighting Company to recover $1,995 damages for the shutting off of his gas supply. He declares the gas was refused for 300 days and he claims damages as fixed by statute. He asserts that he offered to pay $4 he owed the Company, but it refused to accept that sum.

THE Atlantic City, N. J., street lighting contract has been divided between the electric company and the Atlantic City Gas Company. The electric company amended its bid of $67.50 per magnetic arc light by deducting $7.50, thus giving light for $60, the price which they offered last year. This price is on a basis of a minimum of 600 lights. They were also awarded contract for the Boardwalk lighting and the intermediate light, such as are used on Atlantic avenue. The term of the contract is 5 years as against the 10-year term of the old contract, and the lights are cheaper by $15 per lamp than under the old agreement of $75 per arc. The Atlantic City Gas Company's bid of $42 per lamp of the low-unit gas arc type, was accepted, the minimum number of lamps being fixed at 200. It is the purpose of the Board to light Arctic avenue from end to end with gas arcs, the lights being "staggered" in order to get the best effect.

SUPERINTENDENT JOHN J. POWERS has resigned his position with the City Gas Light Company, Ocean City, N. J., to take effect the last of this month. Mr. Powers has made a large number of friends during the 2½ years he has held this position, his efforts to please the Company's patrons being recognized and appreciated by them, and they regret his decision to leave. He has received several offers from others companies, but has as yet made no decision. Mr. Powers will be succeeded by George Brown, Jr., who comes from the plant of the Coast Gas Company, at Belmar, N. J.

THE Honorable Ira C. Copley, President of the Western United Gas and Electric Co., of Aurora, Ills., has just made a trip covering Marion, Herrin, Johnston City and several other places in Illinois, accompanied by Congressman R. P. Hill, who has until the present been recognized as the head of the proposition to put gas in this territory. The Marion "Press" says: "While here Thursday morning Congressman Copley spoke very favorably relative to the matter of establishing a gigantic system in this section. He is a highly successful operative gas man and his words amount to a great deal. Just at this time the prospects seem indeed bright. The gentlemen are from a town known throughout the country as "the city of lights"—Aurora. They are the ones who have helped in the fullest measure to give the city that name."

UNLESS something decidedly improbable develops, the gas supply in the City of Peru, Ind., will be cut off after the next meeting of the City Council. This means that the Council is determined to carry out its threat against the Citizens Lighting Company, to cut off their privilege of operating in the city. The trouble centers on the failure of the Company and the city to agree on a franchise, and, although several conferences have been held, there is apparently no hope of settlement. In fact, some of the Aldermen say there will be no chance of the ordinance being adopted under the conditions asked by the Company. The representatives of the Cit zens Lighting Company decline to make any further concessions to the city. They insist that they have given an equitable rate in their sliding scale of 95 cents to $1.15 per 1,000, and that the other demands, such as indemnity bonds, etc., asked by the council, are out of the question.

MESSRS. WM. M. CRANE and G. H. WARNER, representing the owners of the Newbern (N. C.) Gas Company and the Goldsboro Gas Company, have disposed of their holdings to Philadelphia capitalists, and in the future the two companies will be operated by the International Gas and Electric Company. So far as is known there will be no change in the staff of employees in either office. At the Newbern office F. H. Sawyer will remain as manager and will be assisted by H. D. Wood as superintendent. The force in the Goldsboro office will also remain the same.

HAVING failed to get a permit to erect a large holder on East Twelfth and Clinton streets, the Portland (Ore.) Gas and Coke Company is negotiating for a site at East Eleventh and Clinton, south of the Ford automobile factory. The Company purchased property at East Twelfth and Clinton streets about two years ago and started to construct a tank, when the Council, to head it off, passed an ordinance prohibiting such a tank within 500 feet of a residence or church. This ordinance was upheld by the present administration, and since then the Company has been seeking a new site.

MR. JAMES F. MEAGHER, President of the People's Gas Light and Coke Company, Chicago, warned the judiciary committee of the City Council recently that it was hasty in recommending for passage an ordinance requiring the Company to install gas shut-offs on certain buildings. The proposition has been before the Council for more than a year. The committee recommended for passage an ordinance requiring the Company, at its own expense, to install shut-offs on all buildings, except dwellings and apartment houses of more than three apartments. The ordinance, if passed by the Council, will become effective July 1, 1915.

Utilities Commission News.

BALTIMORE, MD., GAS QUALITY AND SERVICE.—That the quality of gas furnished by the Consolidated Gas, Electric Light and Power Company is up to the standard required by law, according to the present methods of testing, is the opinion of the Public Service Commission, embodied in a letter sent recently to David Bachrach, representing the Park Approach Protective Association. The association, at a recent meeting, adopted a resolution complaining of the quality of gas. The Commission states that the test of the gas for candle power and heating capacity is made daily, and that it comes up to the required 20 candle power. The main pressures are registered by automatic gauges placed at 4 points in the city, showing the pressure for every minute of the day and every day in the year.

QUINCY, MASS., COMPANY AUTHORIZED TO ISSUE ADDITIONAL STOCK.—In an order handed down by the Massachusetts Board of Gas and Electric Light Commissioners, authority is given the Citizens' Gas Light Company, of Quincy, to issue additional capital stock to an amount of $360,000. The company originally petitioned for the right to issue $390,000 in two issues, one of $140,000 and the other of $250,000 to be used for the liquidation of indebtedness incurred for extensions to the physical properties of the company's plant, for the acquisition of additional plant and property and for further development of the properties. Under a previous petition, the board had authorized the issue of the $140,000, but the company overlooked a requirement. Therefore the order is reissued for the issuance of this amount of capital stock. The Board finds that between March 31, 1910, and December 31, 1913, the company appears to have expended upon extensions of its distribution system somewhat more than $210,000. Of the future additions described at the hearing as probably costing about $72,000, it appeared that a portion only had been definitely decided upon by the company to be undertaken during the present year. For this work stock to the amount of $35,000 is approved.

DOLLAR GAS ORDERED IN MANCHESTER, N. H.—The New Hampshire Public Service Commission, in the rate case of the People's Gas Light Company of Manchester, finds that the business has now become sufficient in volume so that under a $1 rate the company can pay its operating charges, make a reasonable reservation for depreciation, and still earn $54,000 annually for return on the value of properties used. A less rate the Commission fears would be confiscatory and illegal. One dollar is accordingly found to be reasonable and just net rate to be charged by the company in the future. The company will be permitted to bill gas at the present rate, making a discount for payment within 10 days to the net rate fixed by the Commission. The company is allowed to adopt a minimum meter charge of 30 cents per month for 3 and 5-light meters; 40 cents per month for 10-light meters, and 50 cents per month for 20 light meters. The new rate is ordered to take effect on July 1, 1914.

HAVERHILL (MASS.) GAS LIGHT COMPANY'S STOCK ISSUE.—The Haverhill Gas Light Company's petition for an issue of $600,000 worth of additional capital stock was approved recently by the Board of Gas and Electric Light Commissioners, despite the bitter fight that has been waged against it by the city authorities. The opinion is very favorable to the methods of the company in regulating its finances, and after exhaustively reviewing them, the Board issues the following notice:

"Ordered, That the Board hereby approves of the issue by the Haverhill Gas Light Company, in conformity with all the requirements of law relating thereto, at the price of $50 a share, as determined by its directors, of 10,200 shares of new capital stock of the par value of $50 each; the proceeds of said stock to be applied to the following purposes and to no other, to wit: The proceeds of 7,527 shares to the payment and cancellation of an equal amount of the obligations of the company represented by its promissory notes outstanding on March 31, 1914, the proceeds of 1,633 shares to the payment of the cost of the properties acquired in the towns of Groveland and Merrimac; and the proceeds of 1,040 shares to the payment of the cost of other additions to plant made subsequent to said March 31st. And if any shares remained unsubscribed for by the stockholders entitled to take them under the provisions of the law relating thereto, is is further ordered and determined by the Board that all such shares shall be offered for sale at some suitable place in the city of Boston, and that notice of the time and place of such sale shall be published in Boston and Haverhill newspapers."

Financial Notes.

THE April earnings of the several companies whose shares are owned by the Commonwealth Gas and Electric Companies, and for the 10 months ended April 30, are as follows:

	1914.	1913.	Inc.
April sales of gas and electricity.	$15,512.77	$14,220.89	$1,201.88
Ten months sales to April 30 ...	170,062.14	145,241.66	24,820.47
No. of customers, April 30	5,750	5,035	715

THE American Gas and Electric Company has declared the regular quarterly dividend of 1½ per cent. on the preferred stock, payable Aug. 1, to stock of record July 18, and the regular quarterly dividend of 2 per cent. on the common stock in cash, and an extra of 2 per cent. payable in common stock July 1 to stock of record June 20.

THE Cincinnati Gas and Electric Company has declared the regular quarterly dividend of 1½ per cent. payable July 1, to stock of record June 13.

THE earnings of the People's Gas Light and Coke Company, of Chicago, are this year showing a moderate increase, and operating expenses have been lower. Officials say the company will be able to earn its high dividend rate on the larger amount of capitalization and increased fixed charges compared with previous years.

WESTERN States Gas and Electric Company is offering through H. M. Byllesby & Co. $50,000 first and refunding 5 per cent. bonds at 89 and interest or on a 5.80 per cent basis. There are now $4,392,000 of these bonds outstanding, in addition to $418,000 American River Electric 5 per cent. mortgage bonds.

BEYER & CO. are offering Continental Gas and Electric Company first lien bonds bearing interest at 5 per cent., running 15 years and maturing November 1, 1927. The bonds are in denominations of $100, $500 and $1,000, and are callable in whole or in part on any interest date at 105 and interest. In connection with this offering the bankers point out that the property is bonded for not over 60 per cent. of value, exclusive of franchises and rights; interest charges on outstanding bonds are earned over three times, strong sinking fund sufficient to retire 25 per cent. of bonds at maturity and additional issue of bonds carefully restricted.

THE new Ohio Cities Gas Company has announced a dividend of 1½ per cent., the initial dividend of the new company, on the preferred stock of the company, which will be paid July 1 to the stockholders of record at the close of business June 15. At the same time the Columbus Gas and Fuel Company, whose stocks and properties will be absorbed eventually by the new company, has declared a dividend of 1½ per cent. upon the outstanding stock which has been unconverted into Ohio Cities stocks, payable at the same time to holders at the same date.

AMERICAN GAS & ELECTRIC subsidiaries continue to show good gains in earnings, and 5 out of the 13 operating companies, which have reported for April and the 12 months ended April 30, 1914, report consolidated earnings as follows:

	1914.	1913.	Changes.
April gross.....	$232,220	$189,024	$43,196 Inc.
Net after taxes..	121,122	103,874	17,248 Inc.
Surplus after charges..	78,365	66,826	11,539 Inc.
12 months gross.....	2,550,482	2,133,547	416,935 Inc.
Net after taxes.....	1,381,189	1,112,652	268,537 Inc.
Surplus after charges .	900,147	718,402	181,745 Inc.

The remaining operating companies do not report their earnings, but as they are substantially in the same territory it is safe to say that their earnings also are showing up well. The company in 1913 earned better than 16 per cent. on its common stock on which quarterly dividends of 2 per cent. are being paid, and even with the increased amount of common stock which will be outstanding this year, as good or better earnings will be shown in 1914.

THE Pacific Gas and Electric Company issued a letter to its stockholders recently, the salient points of which were as follows: Approval asked of charter amendment for reclassification of stock into $100,000,000 of common, $50,000,000 of the first preferred 6 per cent. cumulative and $10,000,000 present preferred stock, making the total as at present, $160,000,000. Subscriptions invited from all stockholders to immediate issue of $12,500,000 in new preferred at $82.50 a share. Holders of old $10,000,000 preferred stock offered right to exchange it for new perferred after July 1, 1916, at rate of 10½ shares new preferred for 10 shares of old preferred. Upon consummation of the proposed plan dividends on common stock will be resumed at beginning of 1915 at the rate of 4 per cent. a year.